

MAY 19 1928

VOLUME IX

MAY, 1928

NUMBER 5

**ARCHIVES OF  
PHYSICAL THERAPY,  
X-RAY, RADIUM**

WITH

**INTERNATIONAL ABSTRACT**

Official Journal American College of Physical Therapy

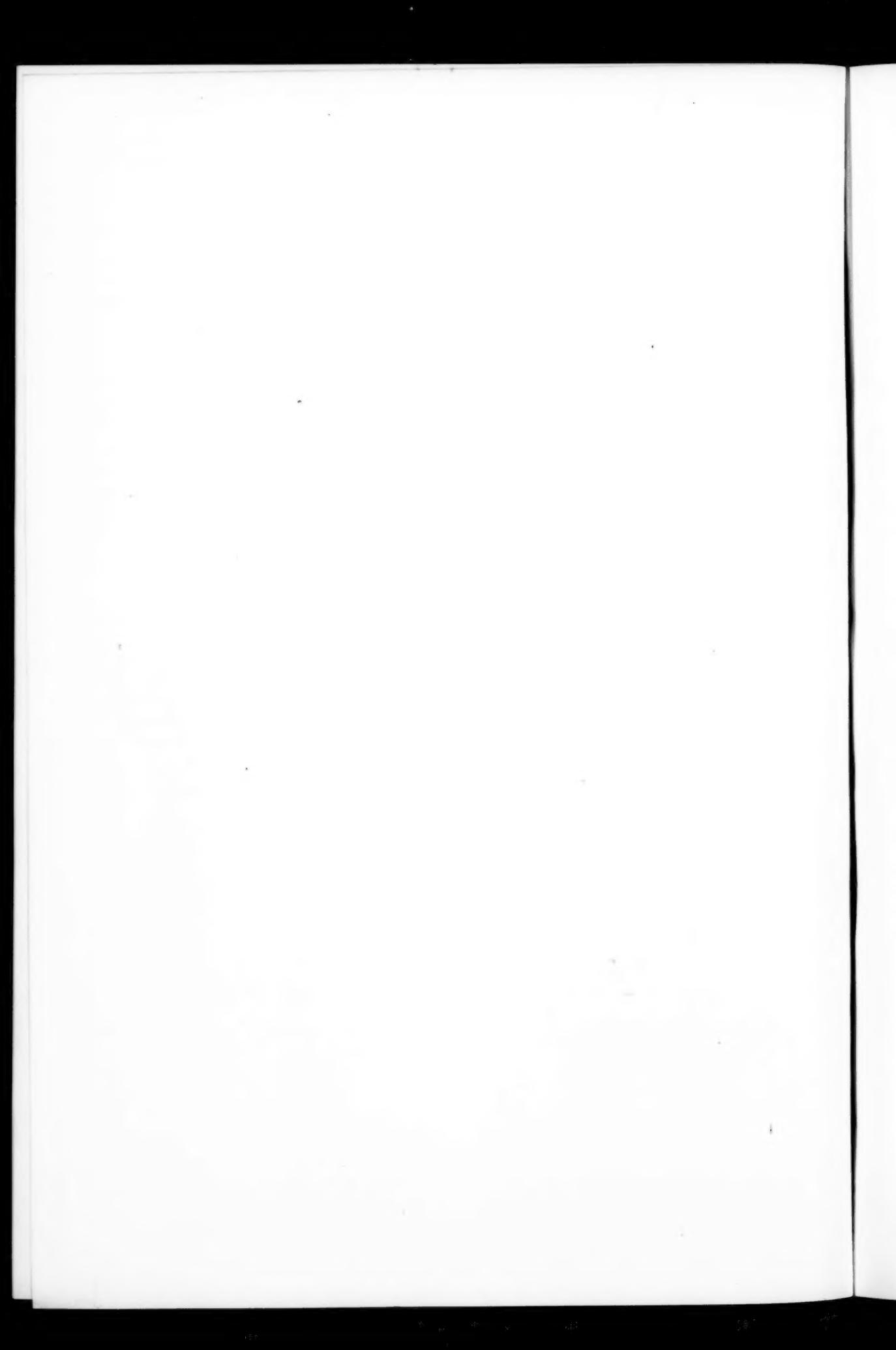
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# ARCHIVES OF PHYSICAL THERAPY, X-RAY RADIIUM

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VOL. IX

MAY, 1928

No. 5

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## PHYSICAL THERAPY IN THE TREATMENT OF ILLNESSES CAUSED BY LIGHT, HEAT, COLD, MECHANICAL IRRITATION AND BY MENTAL OR PHYSICAL EXERTION\*

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The application of light, heat, cold and friction are recognized therapeutic measures for the treatment of a number of illnesses. Certain rules can be given for the application of these agents in the average individual which enable one apparently to obtain maximum benefit with a minimum of harmful result.

It is my purpose in this paper to show that these rules cannot be applied universally, for some individuals are highly sensitive to the action of one or more of the physical agents mentioned. In such an individual the application of a physical agent in average dosage might prove harmful, if not actually dangerous.

It is my purpose furthermore to show that illnesses in such individuals caused by natural exposures to the agent to which they react are often extremely severe and that through avoidance of the offending agent such illnesses can be relieved completely, and finally that such illnesses can be relieved by treatment with the agent to which the patient reacts if given in repeated increasing dosage. The fact is that toler-

ance gained in this way may result not only in complete cure of an illness which totally incapacitates a patient, but frequently changes the harmful action of a physical agent into one which is actually beneficial.

It is well known that patients can become hypersensitive to a large variety of material substances such as pollen, dander, foods, etc., and react whenever they come into intimate contact with them. Some patients are so sensitive that they become ill on contact with minute traces of the agents to which they react. For example, those sensitive to eggs often react to the trace of egg contained in

Dr. Duke has done much research in the field of sensitization to physical agents. In this article he points out some of the reasons for untoward results following treatment by light, heat, cold and mechanical irritation.

hen meat; those sensitive to buckwheat may be made ill by the trace of buckwheat in a drop of honey; infants sensitive to milk are frequently made ill not by any of the usual constituents of milk, but by certain foods eaten by the woman or animal furnishing the milk; and finally, patients who receive blood by transfusion are occasionally made ill, or even shocked, by the introduction of one syringe of blood taken from a donor who has eaten some food to which the patient is sensitive. These facts are proven and have been accepted as

\*Read at sixth annual meeting, American College of Physical Therapy, Chicago, October 31, 1927.

true by authorities interested in this subject. It is also an accepted fact that patients who react to foreign agents can almost always be cured by treatment with infinitesimal ascending doses of the agent to which they react if the agent can be obtained and administered according to certain set rules.

In this paper, I shall deal with that treatment of illnesses caused not by sensitiveness to material substances, but with illnesses of a similar nature caused by sensitiveness to the action of physical agents, such as light, heat, cold, and mechanical irritation—that is, by agents which to normal individuals, are not only harmless in the doses ordinarily encountered but which are beneficial if not even essential to their development, health and actual existence. Cases of this type I have described in a previous paper under the noncommittal term "Physical Allergy" (meaning altered reactivity to the action of physical agents) and have shown that certain individuals sensitive to light can be made ill or even shocked by exposure of a certain proportion of their skin surface to cold (between 5° and 15° C) for one minute, that individuals sensitive to heat can be made to react violently by the appropriate application of one calory of heat and, finally, that individuals sensitive to mechanical irritation can be made to react by a small amount of friction on the skin.

There seem to be two distinct varieties of physical allergy which may or may not be related etiologically. Clinically, the two types are very different. In the one type the reaction is confined to the skin area directly exposed to the physical agent called contact reaction. When a large area of skin surface is exposed, however, constitutional symptoms become manifest. In the other type, the reaction involves not only the skin areas directly exposed, but distant tissues as well, called reflex-like reaction.

The contact cases are much the more apparent and much the easiest to study. The symptoms in the severer cases which react promptly consist of erythema, pruritis and edema of the skin which invariably appear on suitable exposure of the skin to the agent (light, heat, cold or mechanical irritation) to which the patient reacts. As previously mentioned, the reac-

tion in cases of this type is confined to the area directly exposed except that when a large surface area is exposed, under which condition constitutional symptoms resembling shock may appear. Depending on the degree of sensitiveness of the patient and the duration and intensity of the exposure, the rash varies in its appearance and in its time of appearance. In patients who are highly sensitive, the symptoms, erythema and itching, often appear within less than one minute. Edema usually appears within a period of six minutes. In patients who are mildly sensitive, a more intense exposure is required to produce reaction, and symptoms may not appear for several hours. In these cases, the hive reaction is not marked, and is followed by anatomic changes in the exposed skin areas, which persist for several days. In fact, in mildly sensitive cases, the reaction following prolonged exposure may not manifest itself as a hive but almost entirely as a dermatitis, characterized by proliferation by the skin epithelium, desquamation and increased secretion. In some cases the reaction on the face caused by ordinary exposures met naturally is so severe as to render the face unrecognisable.

Not only does the skin react as described but also the mucous membrane of the respiratory and gastro-intestinal tract upon appropriate contact. Several suggestions were made in previous papers concerning the pathogenesis of reactions of this type. In one, which may be worthy of repetition, it was assumed that the patients, coming as they did from allergic families, may have become specifically hypersensitive to some new body formed in their tissues, solely under the influence of one specific physical agent, (light, heat, cold, or friction), and react to this body just as persons sensitive to pollen react upon contact with pollen.

Whereas the contact reactions just described are interesting and important, the reflex-like reactions are the more common and give rise to a more varied clinical picture. As previously mentioned, "Reflex-like reaction" is a term used in describing reactions which are not confined to the surfaces directly exposed to the irritating agent, but which involve distant structures as well. Frequently they involve distant struc-

tures only. In this case, the relationship between cause and effect is often difficult to discover. Reflex-like reactions have all been caused, in my experience, by the effect of heat, cold or light. The former two causes are common—the latter rare.

As with contact reactions, so with reflex-like reactions, there are several different types of reactions. Two which are important are—first the immediate reaction that is the type which appears within a few moments after exposure and second, the delayed reaction that is, those reactions which may not appear for from one to forty-eight hours after exposure. In the former case, symptoms usually disappear within a few minutes. In the latter case they usually last for several days. The symptoms resemble pollen reactions in almost every respect and may involve not only the skin but also the nasal, bronchial or gastro-intestinal mucous membrane or internal organs, giving rise to such symptoms as skin rashes, vasomotor rhinitis, cough or asthma, gastro-intestinal upsets of great severity, irritable bladder or renal colic, etc.

The skin rash is one characterized in highly sensitive cases by erythema, itching and hives, which usually appear within one or two minutes after exposure and last usually from five minutes to half an hour. In less sensitive cases the time of appearance of the rash may be delayed and in this case lasts longer and may appear as angioneurotic edema rather than as superficial urticaria. In patients who are not highly sensitive, the rash is delayed still more in its time of appearance and is characterized by general redness of the skin, proliferation of the epithelium and desquamation. In patients highly sensitive to heat, the rash appears under the influence of remarkably little heat. In one case, for example, hives would appear not only upon exposure to slight amounts of heat applied by the use of a lamp, hot water, or diathermic or autocondensation current but also under the influence of heat generated by the slightest amount of physical exercise, such as that produced by arising from a prone posture or even by turning over in bed, or even under the influence of heat produced by unusual mental activity, such as that caused by interest in a business deal or watching an athletic contest. Many rashes which are apparent-

ly caused by excitement or emotional disturbance belong in this category. The rash can be relieved or its appearance prevented by the application of cold, even so small an amount of cold as that following the use of a fan or a cold compress on the face, arms or the removal of clothing.

Reactions caused by cold are similar to those caused by heat, except that they are relieved by the application of heat externally or even by the heat generated by physical or mental exertion. In several cases of asthma due to sensitiveness to cold, the symptom asthma could actually be received by physical or mental exertion. In one case a marked attack was actually relieved by a fistic encounter. One could surely count on the fact that this would have made symptoms worse rather than better if they had been caused by anything other than sensitiveness to cold.

A theoretical explanation for reflex-like reactions caused by heat or cold is difficult. One might call the phenomena a simple reflex. This would amount to nothing more than placing a cloak of knowledge around uncertainty. An adequate explanation needs be more detailed than this.

The underlying condition responsible for the reflex-like reactions resembles one of an injured nerve mechanism. One might go further and say that it appears like a pathologic reaction of the heat regulating mechanism. It seems remarkable that warm-blooded animals are able to maintain a constant body temperature under such varying conditions of heat and cold, moisture and dryness of the air, rest and functional activity, as the majority of individuals are subjected to. Body temperature under normal conditions is maintained at a constant level through complicated reactions which vary the caliber of the surface vessels and bronchial tubes and vary the secretion of moisture from the skin nasal and bronchial mucous membranes. When the heat regulating mechanism is normal, body temperature can be maintained at a remarkably constant level under the most varied external and internal conditions. It seems within the realm of good reason that this mechanism at times may be injured, and when injured may react in an ab-

normal manner, not only in relation to the dilation or contraction of vessels and bronchial tubes, but also in relation to secretion and activity of nonstriated muscle in general. If such an abnormal mechanism should exist in a person of allergic strain, it seems conceivable that the mechanism might give rise to the peculiar manifestations of allergy which we ordinarily term asthma, allergic coryza, urticaria, angioneurotic oedema, etc. One might advance in support of such a theory the fact that a very large proportion of patients who are subject to reflex-like reactions caused by sensitiveness to temperature change date the onset of their symptoms from a severe illness—often an infectious disease.

I have been able to sensitize cold blooded animals such as frogs, small tadpoles, large tadpoles and minnows to heat by exposure to x ray. The exposed animals almost without exception were killed by lower grades of heat (often as low as about 37° to 39°) than were normal controls which often withstood temperature as high as 39° and 41°. The difference in temperatures withstood was not so great as this on an average but exceeded one degree in almost every experiment. The difference in behavior between the exposed animals and controls upon rise in temperature was even more striking—the exposed becoming quiet or beginning to swim on their backs often at a temperature several degrees below that at which the controls showed a change in activity.

The conditions just referred to have been described in detail in previous papers and summarized in my monograph "Allergy" published by C. V. Mosby and Company. They are reviewed briefly in this connection in order to emphasize the dangers of routine physical therapy in cases of the sort and in order to make understandable the most brilliant results which can often be obtained by physical therapy in cases of this type. In discussing treatment, the contact cases and reflex-like cases must be considered separately since they behave differently toward therapeutic measures.

Contact cases, like pollen sensitive cases, can almost always be partly or completely relieved by treatment with the agent which causes reaction. Treatment must be carried out ex-

actly as it is with pollen sensitive cases—that is, by beginning with small doses of the specific agent which causes reaction and by increasing the dose systematically at suitable intervals until sufficient tolerance is gained to enable the patient to withstand or even profit by such exposures as are encountered naturally. In light sensitiveness, for example, the patient should be treated by exposing the skin to the rays of light to which he reacts. The ray which should be used apparently varies in different cases for some react most markedly to the blue violet rays and some apparently most to ultra violet rays. The skin generally should be treated—not necessarily areas such as the face and hands which are ordinarily exposed and which are usually the site of reaction when the patient is exposed under the ordinary habits of life. The light should be applied in the beginning in such dosage as to cause slight reaction and should not cover too large a skin area. In this way constitutional reactions can be avoided. By degrees, the skin area exposed should be increased and the time interval of exposure lengthened. Set rules cannot be given for time and intensity of exposure because reactions and the development of tolerance varies with different patients and even in the same patient at different times. It can be stated as a general rule that the dose of ray that should be used should be one which causes slight reaction locally and preferably no constitutional reaction whatever. Treatment should be continued until the patient is able to tolerate exposures to light such as he encounters in his usual occupation. This has been accomplished in several instances. In one, however, the degree of sensitiveness was so great that treatment was discontinued before this result was reached. In several cases of light dermatitis of the hands and face which rendered the patient hideous complete relief was obtained by exposing the skin generally to increasing doses of light. A case of vernal catarrh caused by light sensitiveness was associated with photophobia of such gravity that the patient, a boy of twelve, had been forced from childhood to wear brown glasses and had never been able to attend school. Complete relief of every symptom was obtained in less than one month by increasing exposures of the skin surfaces to light.

In the case of sensitiveness to cold, small areas of the skin should be exposed to water at the temperature which causes reaction and for a length of time which is sufficient to produce slight local reaction. Patients sensitive to cold between 5° and 15° C may not react at all to temperatures near zero nor to a temperature of 20° C. Consequently, temperatures must be chosen which are within the range to which the patient reacts. Small areas of skin should be used at first. The size of the area exposed should be increased systematically and the time of exposure should be systematically lengthened. In the majority of cases, sensitiveness to cold can be materially reduced so that the patient reacts less or not at all upon such exposures as he encounters in his daily routine of life.

In the case of patients sensitive to mechanical irritation, splendid results can be obtained by exposing increasing areas of skin surface to the mechanical irritant which disturbs the patient. This is not always the sharpest instrument which can be used. Some individuals seem more sensitive to the scratch of a finger nail than to the scratch of a stiff brush. It is advisable to use the agent which causes the most marked reaction. Fuller brushes are very useful in this type of illness and in the majority of cases a patient can relieve himself materially by systematically scratching the skin from head to foot once or twice daily for a period of from one to several weeks. As a rule, patients become so tolerant that neither itching erythema nor urticaria appear after scratches such as one receives in the daily routine of his life. In some cases the patient is subjectively relieved of very disagreeable itching illnesses but urticaria not associated with itching may persist in appearing after scratches.

Not only are patients relieved of illnesses complained of by the above procedures, but are subjectively better in other respects and often like and cling to the harmful agent which finally proved beneficial.

In patients sensitive to heat or cold having reflex-like reactions, the problem is totally different. Heat sensitive cases frequently run abnormally low temperatures. Any agent which causes a rise in temperature usually causes reaction.

Any agent which reduces temperature usually stops reaction temporarily. The use of low temperature in this type of cases is not a satisfactory cure since the result is fleeting. Any agent which prevents the temperature from dropping is a useful therapeutic measure. Several agents have been reasonably successful in about half the cases. One is a hot bath given at a time when the temperature is nearly normal but is soon to drop (at from 9 P. M. to 2 A. M.), given for the purpose of preventing the abnormal drop in temperature. Exercise, autocondensation or diathermic currents accomplish the same end at 9 P. M. and 12 P. M. and frequently prevent the low temperature which usually appears later and often serves to prevent reactions which are prone to occur at that time. Relief of asthma described by many observers accomplished through the use of autocondensation or diathermic currents often can be attributed I feel sure to the effect of heat on this pathologic mechanism. Many cases of collapse caused by hot baths or high frequency currents can be attributed I feel sure to the application of heat in cases of this type when body temperature is subnormal. A simple method of treating these cases discovered by accident consists in the scratching of the skin from head to foot with a stiff brush. Strange to say, this is often a very effective means of raising body temperature which does not cause reaction. It is not unusual to find an immediate rise of temperature, often amounting to as much as three degrees following this strange procedure. The rise occurs whether the brushing is done by the patient or by a nurse and stranger still, in mild cases of fever, the same procedure often reduces temperature toward normal. This is a somewhat effective means of preventing reaction in a minority of cases.

Any agent which causes fever is likely to completely relieve a heat sensitive patient for a period lasting for from one week to several months. This is true whether the agent causing fever is acute tonsillitis, erysipelas, scarlet fever or pneumonia, or a vaccine. It is for this reason, I believe, that certain cases of perennial asthma are relieved by non-specific vaccine therapy.

Cold sensitive cases having reflex-like reactions are much easier to handle by physical

therapy than heat sensitive cases. Cold sensitive cases can usually be relieved by the application of heat. This is true whether the heat is applied externally through the use of hot bath or a lamp or internally through the use of an autocondensation or diathermic current or whether it is generated internally through physical or mental exertion. A cold sensitive case can relieve himself temporarily by physical exercise, even by a fistic encounter. This type of relief, however, is transitory. As a rule, a cold sensitive case can be given tolerance for cold through the use of frequent cold baths. This, in the beginning, may cause reaction but as a rule tolerance is soon established and the patient becomes able to withstand such exposure to cold as he encounters in the ordinary routine of life.

These observations, fragmentary as they may be may serve to explain some of the results both good and bad which follow physical therapy and if worked out in greater completeness, might help in the choice of cases suitable for treatment with physical agents and give indications for a more logical method of application.

#### SUMMARY

In the treatment of certain diseases set rules can be given for the application of physical agents such as light, heat, cold and mechanical irritation which apply to the average individual and enables one apparently to obtain maximum benefit with a minimum of harmful result. In this paper, cases are referred to which show that such rules cannot be applied universally. Some individuals are highly sensitive to the action of one or more of the physical agents mentioned. In these the application of physical agents in

average dosage causes harmful and even dangerous results. Illnesses in patients of this type caused by physical agents as they are encountered under natural conditions are often extremely severe. The symptoms observed can be classified under such terms as urticaria and dermatitis of greatest severity, "Vasomotor Coryza" or "Rhinitis", cough or asthma, gastro-intestinal disturbances of mild or extreme grade, urological disturbances, such as irritable bladder or even renal colic. The fact is, that few tissues are immune to disturbance caused by the effect of physical agents in sensitive individuals.

The illnesses are extremely specific and are caused in a given individual usually by one and only one specific physical agent. For example, those caused by light, may be caused by certain rays of light at the violet end of the spectrum and by light only. In those sensitive to cold, symptoms may appear only after exposure to cold between certain specific grades, such as between 5° and 15° centigrade.

Brilliant therapeutic results can be obtained through the avoidance of the agent to which the patient is sensitive or through the appropriate application of the agent in repeated gradually increasing dosage. This frequently gives rise to tolerance. For example, through the use of increasing dosage of light in light sensitive cases, cold in cold sensitive cases, heat in heat sensitive cases or of friction in friction sensitive cases a degree of tolerance can frequently be obtained which enables the patient to withstand such dosage as he encounters under natural conditions—in fact, the agent previously harmful frequently after treatment usually becomes beneficial.

## THE PHYSIOLOGICAL ACTION OF DIATHERMY IN LOBAR PNEUMONIA\*

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Lobar pneumonia is an inflammation of the lung.

Inflammation is often spoken of as the reaction of the tissues to trauma, whether chemical, mechanical or bacterial. When such trauma takes place the cells in the involved area are usually destroyed and their reconstruction is observed as mitotic figures attempting to replace the destroyed tissues.

In lobar pneumonia very little evidence of tissue destruction is seen as represented by mitotic figures. The inflammatory reaction is characterized by congestion, edema, extravasation of blood into the alveoli and of leucocytes into the tissues. It is in fact a simple inflammation.

Simple inflammation is characterized by heat, swelling, redness, pain and loss of function. The local heat of an inflammatory area never exceeds that of the internal heat of the body. The apparent local increase in the temperature is due to the rate of flow and to the increase in amount of blood carried into the part. Swelling is due to an extravasation of blood into the surrounding tissues and not to any increase in the size of the capillaries per se. Redness is the result of the amount of blood carried to the part. In the outer part of the inflammatory area there

is active congestion and the redness is of a brighter hue than in the center where the congestion is more passive and the color darker, even almost purple. Pain is due to pressure of the exudate on the nerves. In a throbbing, painful area the throbbing is synchronous with the heart beat. Accompanying these manifestations there is a tension of the tissues surrounding the inflammatory area, so that the return circulation is impeded and the passive congestion is aggravated.

Pathologists describe the inflammatory process of lobar pneumonia as divided into four stages; congestion, red hepatization, gray hepatization and resolution.

Congestion is sudden in onset and lasts but a few hours. The lung is red, swollen, firmer and heavier than normal, although it crepitates on pressure and floats in water. The capillaries are partly filled with blood serum, blood cells and fibrin. The epithelium lining the alveolus is oedematous.

Within about seventy-two hours of the onset of the disease the stage of red hepatization has been established. The affected portion of the lung is solid, heavy, brownish-red in color, no longer crepitates and sinks in water. The capillaries are congested and compressed, but



Fig. 1. Normal lung.

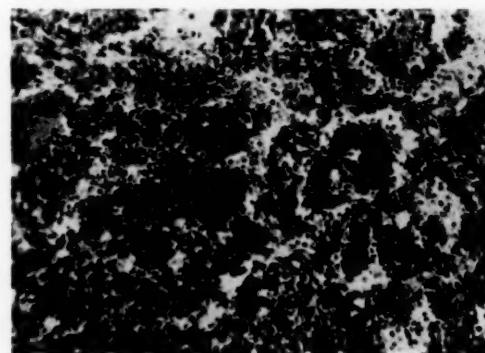


Fig. 2. Lung. Active congestion. Note engorged vessels, bloody exudate into air cells and swelling in the walls of the alveoli.

their lumen is not completely obliterated. The lymphatics and air-cells are distended with serum, cells and fibrin. The exudate forms a plug in the infundibulum and an occasional plug extends up into the finer bronchus. The exudate is still red, the air-cells are expanded and the involved lobe is equal in size to that at full inspiration. The leucocytes which fill the alveoli and surround the blood vessels and bronchi may contain bacteria.

This stage of red hepatization lasts two or three days and is followed by gray hepatization, which is recognized by the grayish hue which the lobe assumes. The red blood cells in the alveoli are shadows. The fibrin is granular and the leucocytes are more numerous but show no phagocytic function. The whole lobe is a warm, moist, dark, stagnant mass which is an excellent medium for the growth of bacteria, from which their toxines may be readily absorbed. The cut surface of the lobe often drips pus. The lobe is swollen, sodden and heavy.

As resolution takes place the plug in the alveolus shrinks, and the fibrin and red cells are dissolved. The bulk of the exudate is absorbed, the capillaries are relieved from compression and are again filled with blood which is in motion. The lung becomes soft; it crepitates on pressure; it floats in water and it gradually assumes its normal color. Death occurs oftenest during the stage of gray hepatization.

The physiological action of diathermy on inflammatory areas is that of hyperemia in its most efficient form; bactericidal, absorbant, dissolvent, decongestant, analgesic and nutrient.

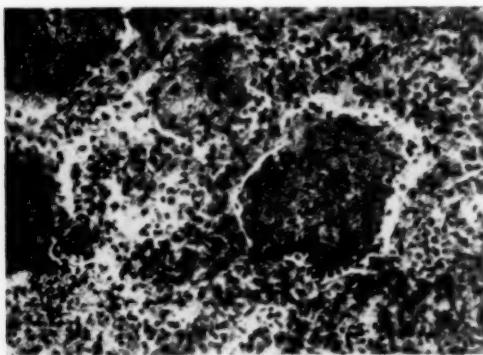


Fig. 3. Lung. Lobar pneumonia. Red hepatization. Note thick alveolar walls and tremendous exudate into air cells.

In regard to the bactericidal action of diathermy we must remember that all bacteria have a temperature at which they grow best. This optimum temperature for the pneumococcus ranges between 96 and 104 degrees F. To raise or lower this temperature inhibits its growth or kills it. The pneumococcus is destroyed in a very short time at 115 degrees F., and its growth is markedly attenuated at 110 degrees F. If we can put through the lung a temperature of 115 degrees for an hour or more a day it is reasonable to suppose that some attenuation of the growth and of the virulence of the bacteria will be accomplished. Some recent articles on the production of deep heat by diathermy lead us to wonder whether or not heat is produced to any extent in the depths of the body. But these articles deal with normal lung which has an open, cellular structure and contains eighty-five per cent air. The hepatized lung is solid, through which the electrical current may more readily pass.

Absorption of the toxic products takes place through the decongesting process, which is the primary action of diathermy. The capillaries and lymph channels surrounding the inflammatory area are dilated, vaso-motor constriction is relieved, the blood gradually increases its rate of flow and extravasation into the surrounding tissues ceases. As a result of this the oedema subsides, and as the water seeps away it carries with it the soluble toxic products. The relief of pain is the result of the reduction of the swelling.

In lobar pneumonia the physiological action of diathermy maintains the stage of con-

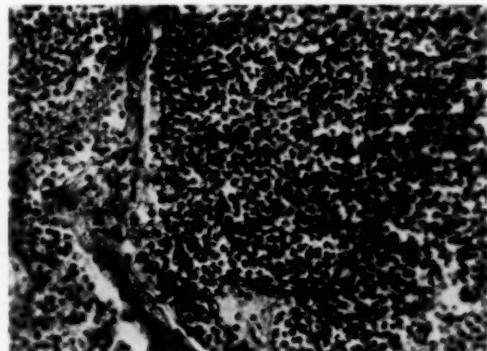


Fig. 4. Lung. Lobar pneumonia. Gray hepatization. Air cells crowded to capacity with exudate. Air cell walls thin and blood vessels empty from pressure.

gestion, prevents the morbid process from progressing to the stage of red hepatization or gray hepatization and afterwards relieves the congestion. It favors phagocytosis by hindering bacterial activity. It promotes lung aeration as is proven by the rapidity with which cyanosis disappears. There is a relaxation of the tension on the tissues surrounding the pneumonic solidification. The blood vessels dilate near, but not in the inflammatory area. The carrying capacity of the arteries and veins is increased. This means more blood flowing to and from the inflamed part. It results in local heat dispersion and an equalization of the interchange of pressure between the vessels and the surrounding tissue. Consequently congestion never becomes stasis. Red hepatization never becomes purulent. Redness disappears when congestion ceases. The temperature falls by lysis. Convalescence is markedly shortened.

The effect of diathermy upon the patient's feeling is gratifying. He is quite promptly relieved of his pain, shortness of breath, cyanosis and restlessness. During 1927 out of 88 patients with uncomplicated lobar pneumonia treated at St. Luke's Hospital within forty-eight hours of the onset of the disease none has died. The total number treated is 94 and the total number of deaths is six. In these six patients treatment was either started late, or the patient was aged, or there were severe complications. The average death rate for all cases is about six and four-tenths per cent. The average mortality of patients not treated with diathermy is about 20 per cent, and has been as high as 35 to 50 per cent.



Fig. 5. Lung. Lobar pneumonia. Resolution.

In the treatment of our pneumonia patients we use as large an electrode as possible both in front and behind. An electrode which does not cover more than the area of the consolidation, as outlined by percussion on the outside of the chest, is not large enough. Tissues outside of the area of inflammation must be included in the region through which the current passes. We use high voltage and comparative low milliamperage. The treatments are given twice daily and are of thirty to forty-five minutes duration. The total number of patients treated is 94. The number of treatments given is 611, an average of six and one-half treatments per patient. The average duration of the treatments is thirty-five minutes. The average milliamperage, including the treatments given to children, is 1100.

#### DISCUSSION

DR. NORMAN E. TITUS (New York City): I can only say that the more of the pathological side of pneumonia we see in cases that have been treated with diathermy, the more we really learn.

As I said in discussing diathermy today, it is pretty hard to believe that any specificity of diathermy in its action on pneumonia exists. As I see slides where the plugs are broken away from the walls to the alveoli and aeration is beginning to get through the lung, we can understand much better why these patients who are cyanotic clear up so nicely and why they react as well as they do.

It is the study of the pathology in such cases that is going to be of great help to us. I congratulate Dr. Clement on giving us an insight of what is in the lung even if the detail wasn't as fine in some cases as he wanted.

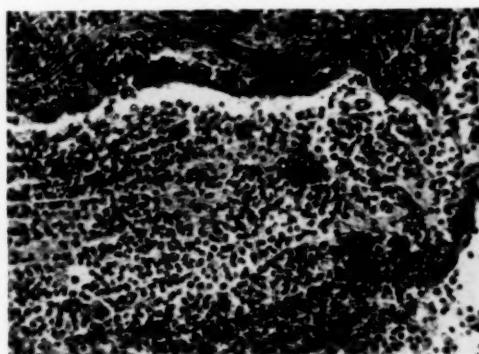


Fig. 6. Lung. Lobar pneumonia. Third day of disease and second day of treatment with diathermy. Death due to post-operative peritonitis. Note resemblance to lung undergoing congestion.

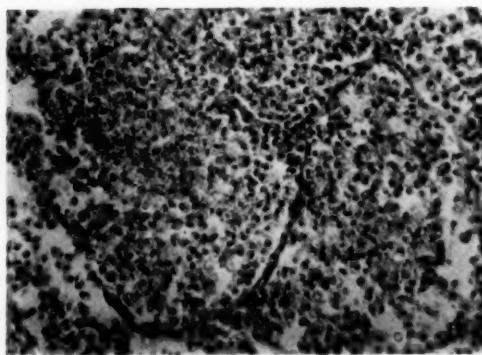


Fig. 7. Lung. Lobar pneumonia. Sixth day of disease and fifth day of treatment with diathermy. Death due to cerebral hemorrhage. Note resemblance to lung undergoing congestion.

DR. ROBINSON (St. Louis, Mo.): I should like to ask if any other treatment was used except diathermy, in these cases.

DR. GAGE CLEMENT (Duluth, Minn.): We used diathermy in pneumonia in addition to every other thing that the physician treats his patient with.

My work is all of a hospital nature. The patients come to the hospital and ask for treatment, and if I don't like the diagnosis I take it up with the attending physician. If he says that a man on one floor has pneumonia, I go up and see if I think he has pneumonia. If he has, I go right ahead and treat him, and I never look at the chart to see what the doctor is giving that patient for pneumonia. I am only there as a radiologist and a physical therapist.

## PHYSICAL THERAPY AND THE ENDOCRINES\*

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I speak from the standpoint of the endocrinologist or internist and one has first to be an internist if he takes any serious or intelligent interest in the endocrines and not from the viewpoint of the specialist in physical therapy.

This paper will be devoted to a consideration of the treatment by physical therapy of disorders of the thyroid, thymus and of uterine fibroids. For hypofunction of the endocrine glands we have a fairly satisfactory remedy in substitution therapy but for hyperfunction of these organs we have no endocrine therapy. Hence a hyperfunctioning gland must be treated, for the most part, by surgical removal of a portion of it, sufficient to bring the secretion to within normal limits, or by exposing it to the rays from radium or the x ray which either destroy the glandular epithelium or put it temporarily out of function. Consequently this discussion will be limited to a consideration of hyper or possibly a perverted function of the glands mentioned. Physical therapy might be considered in relation to hypofunction of some of the endocrines but in such cases it would be used as an adjuvant treatment and would be of less importance than the same type of treatment directed at a hyperfunctioning gland.

### *The Thymus:*

There is some argument as to whether an enlarged thymus causes any symptoms or, at least, whether it is responsible for the symptoms with which it has been credited, but we are fairly certain that many of the symptoms for which the thymus is radiated are relieved by this measure and until we are more certain regarding the question of whether a thymus is enlarged and whether, if enlarged it causes symptoms, we had best follow our present practice and subject it to radiation when we encounter such symptoms.

### *The Thyroid:*

Let me show you a simple classification for goiter and then discuss treatment from that.

\*Read at sixth annual meeting, American College of Physical Therapy, November 3, 1927.

- I. Diffuse Colloid.
- II. Adenoma
  - (a) without hyperthyroidism.
  - (b) with hyperthyroidism.
- III. Exophthalmic.
- IV. Tuberculosis, syphilis, thyroiditis, malignancy.

The diffuse colloid goiter practically never requires surgical intervention or radiation of any sort. It is probably a deficiency disease and the thyroid enlargement is in the nature of a compensatory hypertrophy. This is always a condition to be treated medically unless the goiter needs to be removed for cosmetic purposes or pressure symptoms. Incidentally iodine probably is not the best medical measure for it. This is usually an expression of thyroid insufficiency. Parenthetically let me say that hypothyroidism is much more common than hyperthyroidism. In the aggregate it undoubtedly causes more suffering than all the varieties of toxic goiter.

In France and Switzerland cretinism is so common that the government maintains goiter farms for these unfortunates. A curious feature about the cretin is that he has four generations of goitrous ancestors.

Cretinism is not so prevalent in this country but milder degrees of hypothyroidism are extremely common. This deficiency is directly responsible for a tremendous lowering of physical and mental deficiency in this country and is deserving of a great deal more attention from the public and the profession than it is receiving at present.

The adenoma without hyperthyroidism is usually not amenable to radiation either from the x ray or radium. This probably is of a dual nature being partly in the way of a compensatory hypertropy due to a deficiency of some kind, possibly of iodine, and it partakes, at least in part, of the nature of tumors. In my judgment of this goiter if attacked at all it should be first

of all by medical treatment and if this is not successful surgical intervention should be considered.

The adenoma with hyperthyroidism is quite another matter. A few men believe there is little or no difference histologically between this and primary exophthalmic goiter and that clinically they are indistinguishable. This is an opinion not generally held. There seems to be a difference in the life history of the two, in their response to iodine therapy, in their clinical history, in their effect on the cardiovascular system, and the body economy generally. The adenoma is present many years before it gives rise to toxic symptoms, its course is irregular, remissions being followed at long intervals by exacerbations, the picture being that of a nervous breakdown, high blood pressure or heart disease. This variety does not usually respond so well to iodine as does the primary exophthalmic. True, many cases do respond quite well but many others do not and it is impossible to predict the reaction in any individual case.

Marine believes that these adenomata have some of the qualities of tumors and are governed by the laws governing tumors. This he feels explains the difference in the behaviour of the two. That, of course, constitutes no reason for believing that radiation is not good treatment for such cases, although of 56 professors of medicine or surgery in the U. S. and Canada, 40 believed this to be a surgical condition amenable only to surgical removal and only one mentioned the x ray.

Today the most popular theory regarding the etiology and pathogenesis of Grave's disease or hyperthyroidism, or primary exophthalmic goiter, is that it is due to hyperfunction of the thyroid. On this basis of course the most rational therapy is a partial destruction of the gland either surgically or by radiation. That this theory is not correct is becoming evident to more and more men. Perhaps one of the greatest advantages of radiation over surgery is due to the fact that radiation probably does not permanently cripple the thyroid and eventually the gland resumes its function more or less normally.

The x ray or radium treatment of toxic goiter is based on the same misconception of the etiology of this syndrome as is the surgical treatment of the same. That is, the physical therapist with his rays seeks to destroy part or all of the gland without subjecting the patient to the dangers of operation. While we cannot prove that this theory is wrong the suspicion is becoming more widespread. More men are coming to feel that the thyroid is at most only secondarily involved and that its destruction serves only to break the link in a vicious chain leaving the body to recover as best it may without this important organ.

The arguments against the idea that the thyroid is the offending organ in this condition are too numerous to present here, but for the sake of giving point to these remarks let me call your attention to a few observations. First, it is impossible to correlate thyroid pathology and goiter symptomatology. For example, hypertrophy and hyperplasia are characteristic of the thyroid of exophthalmic goiter but the pre-operative use of iodine so changes the architecture of the gland, the epithelium lining the acini becomes of the low columnar type, and the amount of colloid material in the acini increases, that the gland cannot be distinguished microscopically from the resting type or so-called diffuse colloid goiter. Second, all the phenomena of exophthalmic goiter may be present without goiter. Third, it has never been possible to produce exophthalmic goiter experimentally until Marine and Baumann did so by destroying the adrenal cortex. Fourth, there is considerable evidence that Grave's disease, status lymphaticus and Addison's disease are very closely related.

At the outset of treatment the internist or roentgenologist should have clearly in mind the thing he hopes to accomplish. If he expects to cause a reduction in the size of goiter to normal limits he is much more apt to meet disappointment than if he expects to relieve the patient of symptoms of toxicity and restore him to economic usefulness. It is well that the patient should be made to realize that his cure does not depend always on the amount of reduction of his goiter. Patients are apt to gauge their disability by the size of their goiter.

The fact that the patient may be almost entirely well without his thyroid having been reduced in size emphasizes the fact that the relation of thyroid pathology to goiter symptomatology is an unknown factor and casts a good deal of doubt on the question of whether toxic goiter is primarily a disease of the thyroid.

Just here I want to make a very positive statement to the fact that a patient having a toxic goiter is a very sick person who is not going to completely recover in a short time regardless of the treatment he is subjected to. If he could be made to realize that this is a condition from which rapid recovery is impossible many cases could be treated medically with as much success as with any other method. I am convinced that the trend of opinion will be in this direction in the next few years. One authority on the Pacific coast writes me that he is able to treat these cases successfully by medical means and keep them at work when the basal metabolic rate amounts to plus 60%. A Canadian authority writes me that he is convinced that fewer of these cases should be operated and that he knows that many of them can be well taken care of by medical and x ray treatment.

I do not expect any one to agree with me on this question and do expect to be roughly criticized for making such statements. Knowing this I make the statement only to stimulate thought along this line.

Dr. Hubeny called my attention to a danger in the use of the x ray. I have observed the same thing a few times, namely, a patient who has been taking iodine should not be subjected to x ray exposure until a week or ten days have elapsed since the iodine was discontinued. If this precaution is not observed a bad reaction is apt to follow the treatment. This reaction manifests itself by nausea and vomiting, delirium, increase in pulse rate and nervous symptoms.

Dr. Jenkinson made one of the most interesting reports of x ray therapy and goiter that I have ever seen. I have the impression that he emphasizes its value in exophthalmic goiter and is less certain of results when treating other hyperfunctioning thyroids. Of all toxic goiters the adenoma with hyperthyroidism is probably the one most constantly surgical.

To me it seems likely that x ray or radium does not permanently stop the thyroid from secreting its hormone. For example, we know that radiation many times produces temporary amenorrhea and that later the ovary apparently recovers from the bombardment and resumes its functions. The thyroid probably does the same thing in many instances. This is a decided advantage the x ray has over surgery. The removal from the body of so important an organ is at best a dangerous procedure and the fact that nature many times allows the body to adjust itself more or less comfortably to the loss emphasizes the kindness of nature and not the wisdom of the treatment. So that physical therapy by leaving this gland to the body with the probability that after a time it will resume its normal function presents a decided advantage over the surgical removal of it.

At present the best that can be said of our method of handling Grave's disease is that it is the lesser of two evils. It is more than likely that we shall eventually find that the thyroid is more or less of an innocent bystander and that the real offender is something else, probably the adrenals. Instead of representing a hyperfunction of the thyroid it is probably a hypofunction of another.

Our uncertainty is emphasized by the attitude of different men toward the question of treatment. Dr. Jenkinson and his association present an impressive group of over 500 cases well taken care of by the x ray. They are convinced that most cases should be treated in this way. Another group of equally prominent clinicians in this city are equally certain that surgery is the method of choice in practically all cases of toxic goiter. While from the Pacific coast an equally well known clinician writes that he is able to take very good care of these cases by medical treatment. In view of these differences of opinion it would seem that common sense conservatism should dictate that treatment which subjects the patient to the smallest risk. On this basis medical treatment and physical therapy should handle most of these cases. Unfortunately the surgeons have the floor and the majority not only of the public but also of the profession are convinced that the only logical way to handle

toxic goiter is by removal of the majority of the gland.

*Radiation Therapy for Uterine Fibroids:*

Judging by the technique employed by some men in radiating women having fibroids it is apparently their theory that destroying the ovarian function will cause a retrogression of the fibroid tumor. That this is not correct is shown by the fact that the menopause with its partial cessation of ovarian function does not necessarily bring a cessation of growth on the part of these structures. That fibroids are favorably influenced, that is their growth is inhibited and the hemorrhages, etc., are checked by radiation, is no longer a matter of dispute. As a matter of fact there are retrograde changes following a course of therapy and these structures frequently are greatly reduced in size. But I do not believe, and the weight of evidence is against the idea, that these changes are mediated through the changes in ovarian function. Where the ovaries are radiated it is my opinion that any good influence such treatment may have on the fibroid is due to the raying given the growth incidental to that aimed at the ovaries. As a matter of fact it is quite likely that the ovaries have comparatively little relation to these growths and that the pituitary, especially the anterior lobe, will be found to have a much more intimate relation to them than has the ovary.

Some time ago I reported what I called "An Endocrine Family." There were five girls and

one boy in the family, all of whom showed unmistakable signs of preadolescent hypopituitarism. Four of these girls are married. Only one has ever been pregnant. The son has been married and has no children and at least three of the girls have uterine fibroids.

We know that the anterior lobe of the pituitary is intimately related to the growth and development of the genital apparatus and there is more than a suspicion that this part of the pituitary has something to do with the development of fibroids. As a matter of fact Werner of Vienna has reported considerable success in the treatment of uterine hemorrhage by directing x ray treatment at the pituitary.

I would be interested very much in knowing what this organization thinks of Steinach's theory of rejuvenation by the administration of small doses of x ray to the ovaries. If some one can give me this information I shall be deeply grateful.

The exposure of the adrenals to radium or the x ray as a treatment for epilepsy is mentioned only to be condemned. Some years ago a theory was evolved to the effect that epilepsy was due to hyperfunction of the adrenals. On this basis a good many adrenals were removed with indifferent results. Radiation applied to the same structures for the same purpose has been equally disappointing.

## RADIUM AND RADON IN THE TREATMENT OF EPITHELIOMA OF THE LIP\*

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Since 1919, radium, in our hands, has been entirely replaced by radon (radium emanation) in the treatment of carcinoma.

Radon is a radioactive gas which is extracted from an aqueous solution of radium chloride by a special apparatus.

In the solution used for this purpose there should be not less than from 1500 to 2000 milligrams of metallic radium.

One of the great advantages of radon over radium is that a large quantity of radon, such as 1000 or more millicuries, may be concentrated over a lesion measuring a fraction of an inch in diameter. A millicurie is the equivalent of a milligram of metallic radium.

### DIAGNOSIS OF EPITHELIOMA OF THE LIP.

In the examination of suspected lip cancer, all squeezing and manipulation of the lesion should be carefully avoided.

While in cases of intra-oral cancer we invariably remove a small piece of tissue from the edge of the lesion for microscopic examination, we do not ordinarily do this in lip cancer.

The diagnosis is clinical, therefore, in practically all of the cases reported.

### METHOD OF TREATING THE LIP LESION

In cases we have tried to cure rather than palliate, we have used the following technic, although our method of procedure has naturally varied from time to time.

At a distance of 4 millimeters, 1000 millicuries screened with 2 mm. of silver may be applied for fifteen minutes to a lesion measuring 1½ or 2 cm. in diameter.

At a distance of 1 centimeter, 1000 millicuries may be applied for sixty minutes to a lesion measuring 1½ or 2 cm. in diameter.

\*Read at the sixth annual meeting of the American College of Physical Therapy, Chicago, Nov. 3, 1927.

Many cases require an application to three aspects of the lip. In this event care must be taken that the irradiations do not overlap.

We are opposed to the implantation of radium or radon tubes in ordinary cases of lip cancer.

Large doses applied to the surface of the lesion for short periods are greatly to be preferred to small doses used for long periods.

### METHOD OF TREATING THE LYMPH NODES OF THE NECK

In cases with evidences of involvement of the lymph nodes of the neck, the prognosis must be guarded.

In Broders' series of 516 lip cancers, reported from the Mayo Clinic, the lymph nodes of the neck were operated on in 449 cases.

Metastases were found in 105 cases. None of Broders' cases in which more than one group of glands was involved and no case in which the cervical or submental glands were affected was known to be alive at the time of the report.

The ten patients with metastases in whom good results were reported were cases in which the submaxillary nodes on one side only were involved.

In view of this report, would it not be well to consider all cases with glandular involvement inoperable, except those with only one submaxillary gland affected?

If lymph nodes are to be irradiated, from 500 to 1000 or more millicuries should be used.

At a distance of 4 cm., 7000 millicurie hours may be given to an area of 16 square cm.

We believe that lymph nodes should seldom, if ever, be implanted with radium or radon tubes or needles.

#### REPORT OF CASES

Between January 1, 1920, and January 1, 1924, we treated with radon 74 primary cases of epithelioma of the lower lip.

In 12 patients (16.3 per cent), enlarged lymph nodes that we regarded as carcinomatous were present.

In 62 patients (83.7 per cent), no lymph nodes were found.

#### RESULTS

Fifty-seven cases (77 per cent), three of which had palpable lymph nodes, have been carefully traced.

Forty-seven (63.5 per cent) of these have been clinically well for from three and one-half to seven years. The average duration of apparent cure is four years and eight months.

We believe it is safe to conclude that at least 75 per cent of patients without nodes treated according to the method we advocate will remain well for the three-year period.

Of patients with nodes, 10 per cent will remain well for the three-year period. These figures are only approximate and may well be subject to revision as experience increases.

#### CONCLUSIONS

In the treatment of epithelioma of the lip we believe that a sufficient quantity of radon, i. e. from 500 to 1000 or more millicuries, is very desirable and indeed necessary in many cases.

Great care should be used in handling large quantities of radon so that patients may be helped and not injured. The operator should be protected by heavy screens to avoid injury to himself.

## THE BLENDING OF PHYSICAL AGENTS\*

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In presenting such a paper before the college, the writer feels that the first essential should be to establish a definite reason for its presentation, on the basis of a timely interest. Physical therapy in a major sense is of but recent extensive employment in the western medical world, and until very recently has been developed to its present status, not by any competent instruction in qualified schools, but in the hard school of experience.

Since today however, we are working in harmony and hearty cooperation under the Council of Physical Therapy of the A. M. A., I can scarcely do better than quote from recently published remarks by Chairman Mock. He says: "Physical therapy has come to the front so rapidly and with so much enthusiasm on the part of a great many of us, that great care must be observed lest we go too far with it. I don't know whether it would be a good thing for every doctor in the country to have physical therapy equipment in his office or not, after traveling around and seeing the way some doctors are using it. We must train a new tribe of doctors in the future, who will know it just as they know how to give castor oil and strychnine. Then perhaps it will be safe. Today it is not safe for every doctor to have physical therapy equipment in his office. Physical therapy came into its legitimate place in medicine during the World War. Today it is gradually taking its place with the usual medical and surgical procedures. Unless we guard against allowing it to replace careful diagnostic measures, followed by well defined but less spectacular methods of treatment, and especially unless we guard against its insidious tendency to make its master an easy living, physical therapy may lead into dishonest practice and quackery."

This is the thing in a nut-shell. We must be physicians in the highest sense first and physical therapists thereafter. And the physician must ever be one who shall examine, diagnose

and then prescribe that treatment which will best serve the desired end result.

Toward such an attitude on the part of the physical therapist I am hoping that what I may say shall stress the thing which I have preached for years, namely—that every manifestation of energy is nothing more than a manifestation of a definite band as it were, in a spectrum of universal energy. More and more science is demonstrating that all force is one. Any force manifestation, even to life itself therefore becomes but that exhibition of energy set up by the atomic vibratory ratios of the particular band in the universal spectrum which brings it about, and in our efforts at curing disease, especially in the physical therapeutic field, we are simply directing one band of the spectrum against another—one force against another, in order to secure results. Yet—and in this lies the crux of the matter, these bands of definite manifestation, shade and blend one into the other quite as a matter of course. And in this fact must be found the foundation upon which my brief effort to point out the practibility of blending and shading the various agents we now employ in physical therapy shall stand.

To discuss all the agents employed today in this newest field of medical advance, would be beyond this paper's time limited scope. I shall therefore confine myself to a discussion of those agents dependent directly upon electrical energy or derived therefrom—the direct current, the sinusoidal current, the faradic current, the high frequency current, static, thermal therapy, phototherapy as embracing actinic or ultra violet radiation and x ray. These are things in daily use, and as such things which we should use with complete intelligence, and use only after they have been intelligently PRESCRIBED.

To prescribe a thing intelligently, means an understanding of its potentialities and their action upon the condition against which aimed.

Toward such an understanding let us consider the physics of these various agencies first.

\*Read at sixth annual meeting, American College of Physical Therapy, November 3, 1927.

And to begin with, let us understand that electricity, be it the direct current, a sine current, a faradic current, a current passed through a primary coil for low intensity or a secondary coil for high intensity or how handled, is ELECTRICITY first and last—is but one band of the universal spectrum of energy, manifesting differently according to how prepared for use, and absolutely nothing else.

With this understanding let us take up the various shadings of current, beginning with the direct.

A direct current is exactly what the name implies—a current flowing definitely and constantly from one pole to another, always in the same direction.

A sine current is an alternating current so controlled that it reverses itself—that is its polarity, in the form of a perfect sine, rather than in the irregular or notched manner of the reversing wave of the alternating current not so controlled.

The Faradic current is one induced by the passage of a primary or feed current through a magnetic field, about which a secondary coil is imposed.

A high frequency current is one stepped up through a primary and secondary coil, one or both to a degree of reversal or oscillation as it is termed, so frequent that it amounts to anything from 50,000 to several million reversals per second.

The static current is one set up by the discharge of a condenser—a high tension current suddenly released at such a time as its tension rises to a point to determine such discharge.

All electrical currents, be they those of electricity as commonly called or its employment in telegraphy, power, heating, wireless or what not lie in a band of the universal spectrum extending from 5,000,000 angstrom units to a length as yet undetermined of miles.

The angstrom unit is a wave length of etheric vibration approximately the one ten millionth of a millimeter long. It is the commonly accepted standard of such wave length measurement, although the millimicron ten times longer and the micron again ten times the length of the millicron are sometimes employed.

In this field we find the thermal modalities, the most generally employed of which are the infra red in the zone above 7,800 angstrom units and the deep therapy lamps and lights which lap over into the visible light region below 7,800 angstrom units to some extent so as to include not only the infra red to a certain degree, but also the reds and orange of the visible spectrum band.

Any sort of apparatus which will give off definite heat will produce thermal effects. These modalities therefore are radiations produced by passing currents through differently designed resistance devices, so constructed as to give off the radiations desired. In the spectrum of universal energy they stand between the electric and the phototherapeutic fields. Technically the latter begins at 4,000 angstrom units and extends down to the limits of x ray activity at 0.1 angstrom unit. The upper end of this zone is the one in which we find the ultra violet or actinic ray action in both natural sunlight and that artificially produced. We divide the zone between 4,000 angstrom units and 500 angstrom units into three sub-fields—the near, intermediate and far ultra violet.

Directly below the far ultra violet, beginning at 500 angstrom units and reaching to 0.1 angstrom units we have the x ray field far in the zone of invisible light, but so well known both in diagnosis and therapeutic employment that we will not discuss it here. And below this we enter the zone of radio-activity—the region of radium emanation, which appears to be but the electronic discharge from atoms in the process of disintegration in so far as at present known.

This then briefly indicates the physics and quality of the agents we have undertaken to discuss. As with the study of therapeutics, we have established the source and quality of the agents we intend to use. Carrying on the parallel let us now consider the reactions of the several modalities upon the body tissues, in order to determine their therapeutic effects.

First the direct current. It is the one chemical current per se. Due to the well established fact of electrolysis we know that it uniformly establishes a definite chemical reaction at its two poles, upon which we depend for our results.

With the current in operation, the negative elements of a solution transmitting medium such as the body seek the positive pole and the positively charged elements the negative. Literally it is the flowing of these elements—in reality the electrons and protons of the tissue atoms, called ions, in one or the other direction which IS the current. But what is the result? At the negative pole an alkaline reaction is ALWAYS set up. An acid reaction ALWAYS develops at the positive. The negative pole therefore promotes circulation, nourishment, drainage, and predisposes to bleeding by its vaso-dilating effect. The positive pole causes vaso-constriction, limits circulation, checks hemorrhage and inflammation. The negative pole is irritative and increases pain primarily. The positive pole is sedative and allays pain as a rule. The negative pole softens tissues, or even destroys them by a caustic alkaline reaction in sufficient concentration. The positive pole hardens and tones tissues, or destroys them by an acid reaction. These are results in zones about the poles depending upon the size of the electrodes, the density of the tissues and the current strength. Between the electrodes the lines of force diffuse. There is however some unquestionable effect throughout the entire area between the poles, for the simple reason that if there were not, the current would not pass, since it is upon the ionic flow in itself that its passing depends. Ionization of chemicals is another effect of this current. Chemicals may be driven in from either pole, dependent upon their own reaction, to a slight degree of penetration. This is taken advantage of for gaining certain localized effects about the poles. Briefly then a decided change in the actual electronic balance of the tissue atoms, is set up by the direct current during its passing, and is maintained for some time afterwards.

Now what is the sine wave effect? The sine is an alternating current. It reverses its polarity with each alternation. Therefore the element of polarity on which the direct current effect is chiefly based, is in the use of the sinusoidal largely is not entirely wiped out. Here we gain not a steady flow in one direction, but a pendulum action—a shuffling of the ions to and fro, an oscillation. Literally the sine current is one by which at will, we set up what amounts

to an ATOMIC MASSAGE. It will stimulate the contractility of striped or unstriped muscle fiber, through setting up within its elements what amounts to a passive exercise.

The faradic current is an induction current. As used it is broken up by an interrupter so as to gain either a higher voltage, or a high frequency of interruption impulses separated by very minute interruption gaps, or both. It is stimulating to both muscle and nerve, though not as intensely so to the former as the direct current when interrupted. Its chief use today is in testing for nerve and muscle degeneration and for their treatment, in conditions resulting from trauma or disease.

Below 10,000 interruptions or reversals per second, nerve and muscle tissue will react by contraction. Past 10,000 interruptions or reversals per second they will not. We come now into the high frequency field.

The currents oscillate at a rate of from 50,000 to several million times per second. Authorities today are divided in opinion as to how frequent these oscillations should be for best effect. D'Arsonval and Nagleschmidt however are now advocating currents of from three to six million oscillations per second as probably capable of increasingly good results.

What happens then in the tissues when such a current is passed? Because of extreme oscillation, polarity to all intents and purposes no longer exists. But the atoms and their ions, especially the latter are thrown into intense oscillation. Oscillation means friction and friction means heat. Diathermy, the term coined by Nagleschmidt means literally "heating through." And until very recently we have believed and taught that this heat, engendered by ionic oscillation, with its resulting relaxing, tissue softening, circulation stimulating, hyperemia inducing effect was the factor to which our results were due. Recent experimentation however has cast doubt upon this belief. If Bettman and Crohn are right, the old idea that heat could be focused in the tissues by this method must be scrapped. Their results would indicate that such heating can only occur in regions where internal density is increased, thereby offering increased resistance to the current. Where such increased resistance

exists, there heat will be produced. Their experiments moreover indicate that high frequency currents like other electrical currents diffuse rather than focus between the electrodes, and that this diffusion is greatest midway between the electrodes, exactly as with the direct current, and that high frequency, like galvanic current, follows the path of least resistance rule; consequently does not deeply penetrate the internal viscera as has been thought heretofore. If they are right in their findings, then we must alter our belief that the entire effect of high frequency treatment depends upon heat and fall back on a probable, as yet undetermined ionic effect, aside from any question of heating. Because it is certainly true as any number of accredited clinicians will state, that some effect is produced in the internal organs, either directly or indirectly by those currents. And in the words of LeDuc, father of Galvanism in Europe: "Results are results." For years the writer has felt that there *was* more to it than mere heating, and has inclined to the belief that the marked effect on the ion was probably the chief factor in our work. This conception indeed would instantly blend this modality with the other types of current now in use.

High frequency use today is largely as medical diathermy, using currents of low voltage intensity, surgical diathermy with high intensity currents and autocondensation, wherein the patient is literally made into a condenser cell for an induction current generated from an induction pad. Used thus—this modality may be used to influence circulation, induce hyperaemia, relieve pain, destroy tissues which it is desired to destroy, determine depositions of lime salts in bone, bring about regeneration of atrophic tissues, check as adjuvants at least, infections in tissues where there is no free pus, or increase drainage from infected surfaces where drainage is present, promote healing of wounds, lower high blood pressure and raise low blood pressure according to how applied.

A static current is a high tension current, but one which does not convert the patient into a condenser cell, but rather into a grounding medium through which the condenser cell of the apparatus is discharged, with a resulting mechanical, thermal and chemical effect upon the basic

tissue cell. Static currents are used chiefly for stimulation or the relief of pain conditions, and decongestive effect. This statement must not however be taken to indicate that unlike other currents static does not produce a general secondary effect, because quite essentially it does.

This brings us to the infra red and therapeutic light. These depend in so far as we may at present determine upon heat for their effect, such as, relaxation and hyperemia rather than in appear to act through the effect of heat in bringing about warming of the tissues, relaxation and hyperaemia rather than in any other way. They are used for the relief of congestive pain and to promote local hyperaemia, either for its own effect, or as a preliminary measure to the employment of other agents, the action of which may be thus increased.

And now let us consider the ultra violet or actinic ray, that small band of etheric activity upon which the existence of all plant and animal life seemingly depends. A part of natural sunlight and hence the factor in natural Heliotherapy, it is apparently the chief factor in all plant and animal development and growth. The exact nature of its operation either as a part of the solar spectrum or in the form artificially produced by mercury arc or carbon-arc lamps is not as yet fully understood. But the experiments of Steenbok, Hess, Bovie, Meinstock, Nelson, Gyorgy, Hottinger, MacKay, Rosenheim, Coward, Schultz, Pohl, Heilbron Koch, Cahan, Gustavson and numerous others appear to show that it hinges upon its quality of activating certain of the sterol group of contained body substances (ergosterol, a concomitant of cholesterol in animals) and the physosterols in plants. As a matter of chemical fact the sterols of animal bodies are the end products of the physosterols in plant substance, derived after animal ingestion. Certain it is that upon some such activation its effect upon the body metabolism must depend, since repeated experiments have shown that such substances irradiated outside the body and then ingested, have an identical effect upon the physical economy as the direct bodily irradiation by either sunlight or lamps. Hess of New York has stated in substance that it makes little difference whether one is himself irradiated or eats irradiated

ated food. The effect will be the same in either case.

Depending upon its varying wave lengths the ultra violet field produces varying effects. From 4,000 to 2,900 angstrom units it is stimulating to the metabolism, and below 2,900 angstrom units it is bactericidal and tissue destroying to an increasing degree.

Clinically this band in its several gradations is employed for its effect on the lime and phosphorus balance, for the increase of haemoglobin and cells in anaemia, for generally stimulating metabolic effects, hence in conditions of malnutrition and subnormal development. Properly employed it is one of the most potent tonics on earth.

As regards x ray, its effects are so well known both from a diagnostic standpoint and as regards its routine employment in a therapeutic sense as an agent against malignancy and an adjuvant in other conditions such as peribronchial infections, the field of dermatology and as an agent in healing certain types of wounds and burns, that I shall merely mention it in passing. Its zone of manifestation is between that of the far ultra violet and radium.

And now having considered the physics and therapeutics of the various agents under discussion, we are ready to build the physical therapeutic prescription, exactly as the internist might write his prescription consisting of one or a number of complementary drugs. Once we have diagnosed our case, the problem confronting us becomes simply this: May the condition discovered within the patient, be best affected by a chemical process, by thermal application, by an attack more or less mechanical in its nature, or by reactions set up by the field of invisible light or possibly by a blending of two or more of these agencies toward a fuller effect?

These are of course, things to be learned chiefly by experience. And the chief animus of this paper is to voice an appeal to each and every man employing physical therapy, to observe close and think deeply in order that the experience, the definite knowledge so gained may be recorded and thereafter broadcasted to the rest of us.

But there are certain fundamental considerations in the building of the physical therapy prescription, which it may do no harm at this time to briefly enumerate.

Wherever there is an inflammatory condition, one must ask himself whether it is acute or chronic, whether it is infective or reactive to trauma, first. For the answer to these questions will make a vast difference in technique. A boil is an acute infective inflammatory condition. The best way of aborting it or sterilizing the infective zone is by coagulation of the central nidus of infection by galvanic positive pole zinc ionization. An old endocervicitis is a different thing. Here positive galvanism is not enough. True we have an infective inflammatory reaction here also, but we have need first of stimulation rather than sedation—we have need of setting up osmosis—of a serum flooding of the infective field, by increased circulation—of what amounts to drainage from the infective area, as well as of a change of chemical reaction in that area. Therefore we shall prescribe negative galvanism first, followed by positive galvanism after a few preliminary treatments. And we will get a changed chemical reaction, an improved circulation, a softening of the products of old inflammatory processes first and after that a healing, disinfecting and tissue toning effect when we come to use the positive. Surgical diathermy may here be used by choice. In old endometritis cases—in displacements of the uterus, the prescription will be largely the same, with the addition of the sine wave in the later stages of treatment for its muscle toning effect. The same is not true of subinvolution. Here we will prescribe positive galvanism plus sine wave first, and the result will be good. In old cellulitis cases we desire to soften exudate and aid its absorption. The two agents we possess, best able to do this are negative galvanism followed by diathermy at the same seance. In traumatic inflammations, sprains, dislocations and fractures, diathermy and radiant light alone or combined give excellent results.

If the condition is congestive—one of stasis rather than inflammation, what shall we use? Heat relaxes, heat promotes circulation, heat relieves pain. Very well. Let us use infra

red or deep heat lamps. If the effect is what we desire, well and good. If it is not let us add to our prescription, medical diathermy, and if still not satisfactory we may try massage of the affected zone by a gentle sine wave.

These are examples, nothing more. The main thing is to ground oneself firmly in the physics of each agent and then use one's head. Curran Pope, one of the deans of physical therapy in the United States, says he knows of nothing more efficacious in post influenzal chest conditions than diathermy applied to the chest. But does he confine himself to it? He does not. He uses it, but his prescription is more apt to read—diathermy, plus interval x ray, plus galvanism, with possibly some static added—since he has found that each of these agents serves a definite purpose in the clear up of the case.

In old leg ulcers—actinic ray of course to stimulate circulation and epithelization, but x ray also to aid circulation support through cicitration of superficial capillaries without which in the majority of cases the ulcer though healed will not stand up. Or during healing, diathermy and high frequency massage of the zone about the ulcer may be used. Or in a very sluggish condition negative galvanism may be first employed followed by actinic ray—first stimulation, softning of the ulcer edges and change of chemical field reaction, then actinic ray to stimulate circulation and epithelization and x ray if needed to cicatrize.

In intestinal stasis, due merely to an atrophic condition of the unstriped fibre, or in constipation, following post operative adhesions, we have a ready means of gaining relief. In the first condition sine wave may be enough. But in most of these conditions we have a relaxation of the abdominal wall musculature. Don't forget that. Sine then to the abdominal muscle—sine of a slower, more surging type to the gut. In the second condition, however, this will fail if used alone in so far as concerns a complete result. Here we add negative galvanism to our prescription for its softening effect, and we may add diathermy to increase that effect. Then use sine for its massaging, stretching action. And if there is a suspicion of a subnormal

liver action, we may use diathermy through the hepatic zone for its stimulation of liver function.

In traumatic conditions particularly about joints, if not infected and recent, diathermy—if infected and accessible, diathermy, galvanism, actinic ray, short type, if longer duration with beginning or definite fibrous tissue changes, galvanism negative type, diathermy, sine wave, slow, or passive motion at the end of the seance.

In the arthritides, diathermy and galvanism are the agents of choice.

In nerve injuries and resulting paralysis and in neuritis from infectious processes or trauma, and in the resulting muscle degeneration and atrophy, both for testing and treatment, galvanism is the first thing of which we think. It will bring muscle reaction after the response to faradism is lost. Yet faradism is of definite use in treatment and should be used. Diathermy also is of value to influence nutrition and relieve pain.

In the healing of burns—actinic ray and x ray will give good results. Under proper technique with the air cooled lamp epithelium rapidly builds up and many denuded surfaces may be healed where otherwise grafting would be required.

In scars of a painful or disfiguring nature, or resulting in limitation of motion, galvanic negative current with sodium chloride ionization and diathermy will give excellent results.

In ammenorrhoea and dysmenorrhoea, negative galvanism, diathermy and static should be used. In metrorrhagia and menorrhagia, fibroma positive galvanism, x ray and as a last resort radium should be used.

And so on to an infinite degree and variation. These are but examples. I could enumerate others for hours if I liked. But I feel that these must serve to indicate what I mean by blending the modalities we use.

Above all we must be PHYSICIANS in the larger sense. In many, I might almost say in most of the conditions we shall treat we may with advantage employ not only these newer agents of effect, but also drugs. Our sense of balance must be preserved. And exactly as we

prescribe chemical medicaments, so must these newer agents of remedial power be—PRESCRIBED.

Firm in our knowledge of their qualities, their potentialities, remembering always that each shades into the other, that in actual truth they blend and overlap, because each is but a band in the spectrum of that universal energy in the midst of which we live—we may then aim them at the condition by which we are confronted and prescribe their employment with intelligence.

If I have succeeded in exciting your interest along the lines of such a building of the physical therapeutic prescription, then the object of this paper has been served.

#### DISCUSSION

DR. EDWIN N. KIME (Indianapolis, Ind.): We require in our schools that our students study pharmacology, the action of drugs upon animals. We require that they study their effects or reactions upon patients in the clinic. We require that they show a certain aptitude in mechanical manipulation of tissues.

Why should we not expect one who utilizes physical agencies to first satisfy proper authorities that he is competent to do so? Perhaps the answer to this question is the fact that many believe there is no particular value to these agencies. Many believe they are not capable of doing harm. Both of these beliefs are not true. The latter should be emphasized. These agencies may do positive harm, and in addition, of course, negative harm in the failure to apply certain specific agencies, certain specific therapies, such as diphtheria antitoxin or surgery for appendicitis, and that sort of thing.

I think the essayist is to be commended upon his attempt to cover these agencies and to give us their effects in such a manner that we can apply them and blend them, as he states, with the therapy that is required. It is most essential that we should have a diagnosis in every case.

What will light do every time you use it? What will galvanism do? Dr Giesy has spent the major part of his paper establishing these primary premises, and unfortunately he didn't have the time to make his applications. Therein lies the crux of the whole story. Not only must we first teach people to use and know the proper effects of these agencies, but we should teach the proper blending of them with such other measures as may be of benefit.

Let me give just one example. The wife of a prominent official who has had a breast amputation a year ago developed a severe wound infection and erysipelas which spread over her chest to the opposite side. She was critically ill for weeks. This left her with a hand that was bound to the side. It was necessary that she be

kept perfectly quiet for months because of the critical state she was in.

I was asked by the attending surgeon, a year after this condition occurred, to see this patient and see what could be done for her in the way of rehabilitating this shriveled, atrophied arm. In consultation it was brought out that he thought the condition was such that massage would be contra-indicated a year after the infection had quieted down. Furthermore, because of the fact that the patient had kept the arm in the same position for so long she wouldn't allow manipulation.

I first had to win the surgeon over to the idea that we do have in modern physical therapeutic methods agencies which will act upon tissues in a mechanical way far superior to what we can do with our hands, and that there was something further to be done to this patient than diathermy. His whole idea was to give her diathermy.

Diathermy is all right if used properly, but it certainly is not the sum and essence of physical therapeutics. We require other agents in order to carry out the treatment the patient demands. Heat, air right, but follow it up with some sort of mechano-therapy. Chemical activities, chemical effects upon tissues, light and so forth, all of them blended properly, is to be prescribed by one individual, a well qualified, experienced medical man.

DR. L. E. PARISEAU (Montreal, Quebec, Canada): May I give my reaction to the word physiotherapy prescription? Evidently before we prescribe we must learn the rules of the art of prescribing. Sometimes the prescription is a relatively simple matter.

If, for instance, I decide I am to blend infra-red radiation with massage it doesn't take much of a physiotherapist to say there will be no incompatibility. What is done on the main blood vessels with massage will be repeated on the capillaries with infra red, but we must remember that there are in our prescriptions, in our physiotherapeutic prescriptions, the possibility of having incompatibility.

Merely to show you where we stand and how little we know, I will just draft a prescription, ultra violet so much per cent, infra red so much per cent. Do they blend or do they counteract each other? That would be an important matter to know in making this prescription. Must I put together ultra violet and infra red?

If you care to review the literature, and if you care to listen to the pseudo scientific lingo that has been given to us all around by dealers, and so forth, you will be absolutely up in the air.

Physically there is, to a certain extent, an antagonism between infra red rays and ultra violet. You can undo with infra red part of what you do with the ultra violet. There is a typical experiment to show that. Use a zinc sulphate screen, and you can extinguish the phosphorescence by throwing a beam of infra red on it. Do they antagonize in the system? That is very important or else we can't prescribe. Some

experiments seem to prove they are directly antagonistic and other experiments seem to prove they are not.

On my way to Chicago from Montreal I cut the pages of a French book given up to the study of ultra violet radiation. This very interesting book was written by Dr. Guillaume and gives twenty-five different kinds of experiments to determine whether the ultra violet radiations and the infra red are antagonistic. The funny part of the whole thing is that you will find one text book telling you that they are, so that if you want to get the full effect of ultra violet radiation you must avoid any concurrent infra red, to the point of closing the windows if it is a fine day of sunshine.

If, on the other hand, you want to go in the commission booth you will find ultra violet lamps being sold with the back of the reflecting hood an infra red generator. Who is right and who is wrong?

Here are two directly antagonistic statements. As a matter of fact, we know nothing about it and we must start experimenting. It is a question for the physicists to solve and one for the physiologist. When we try to solve this question and experiment we will have to use a little, a very little, but a minimum of the experimental horse sense that is used in ordinary laboratories by men of science, men of positive science.

What do you think should be the conclusion when Dr. A. comes to me and says, "I know the infra red activity and the action of the ultra violet because I made this experiment on a patient? I gave him a dose of infra red for ten minutes and then I gave him what was not an erythema dose of ultra violet."

That experiment is absolutely fallacious. If you want to know whether the rays are antagonistic you must use them concurrently. What did Dr. A. do? He simply reddened the skin with infra red and then took it away. All he had before him was a question of hyperemia. My answer to Dr. A. is simply this,

that doesn't prove anything about the infra red. It proves the skin is in a state of hyperemia and is probably more sensitive to the ultra violet. As a matter of fact, the same effect could be obtained with mustard or rubbing with a stiff glove before starting with the experiment.

All this is merely to show that we have very much to learn in the way of synergizing different agents. Are they antagonistic, are they synergistic? Only then will we be able to prescribe intelligently. For the moment the blending question is a very difficult one to solve.

DR. J. U. GIESY (Closing): In closing I merely want to thank Dr. Kime for his friendly assistance, and Dr. Pariseau for bringing out a very important point.

As in any other prescription we have the compatible and the incompatible, and it was toward knowing how to use these things that I was induced, or inspired, to write the paper, such as it was.

With no apology to any one and with no animosity toward any one, I must say that since this thing has been taken up largely in the United States this country has been railroaded into physical therapy. We have gone into it without due preparation or due foundation of knowledge, and we have gone into it largely upon the say-so of people who at least alleged that they did know something. In other words, we have gone into that beautiful and clinical faith which may lead to the celestial regions or to disaster. Consequently, just to get you to think about it was the only real reason I wrote the paper.

I think there is a great truth in physiotherapy. We are dealing, just as I said, with a band of universal energy in a universal spectrum of energy which embraces our own lives, and that is a scientific fact capable of scientific demonstration more and more.

## ULTRA VIOLET RADIATIONS IN THE THERAPY OF PULMONARY TUBERCULOSIS\*

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In a previous paper regarding the therapeutic possibilities and application of the ultra violet light in the treatment of pulmonary tuberculosis, I called attention to the frequency with which the general practitioner is called upon to render service in these cases, and of the necessity of his being able to approximate as closely as possible the classical treatment of this class of patients as would constitute the regime in a sanitarium.

Obviously the ideal treatment would be that of the sanitarium, and the rational procedure would be to send these patients to some institution devoted to the treatment of tuberculosis where the conditions would make for a more scientific study of the case. Too often, however, there is a lack of local institutional facilities, or more often a decided objection on the part of the patient or his family toward institutional domicile, which makes it imperative upon the local physician to bring to his aid all methods of treatment which the exigencies of the case require and his armamentarium will admit. The general routine of treatment in these cases, such as diet, rest, out-door sleeping, etc; can in the great majority of instances be instituted in the home of the patient and maintained without causing much inconvenience or expense to either patient or family. The question of adjunct treatment is one, however, which offers difficulty of solution, and many factors should be considered in making the selection.

At first sight it would appear that heliotherapy would be the method of choice, not only from the ease of application, but also from economic principles. I think, however, that a close scrutiny of the field will show that in ultra violet light we have an agent which is not quite as easy of application, but offers the distinct advantage of being applicable at any season of the year, whereas heliotherapy is subject to climatic conditions, and especially in this latitude is not

admissible under ordinary homing conditions during the winter months.

Like heliotherapy, the ultra violet light is capable of doing great good, and that it is equally potent for harm is a fact only too well recognized by those who are making daily use it in their practice, and the haphazard and indiscriminate exhibition of ultra violet light in pulmonary tuberculosis is just as reprehensible as shotgun prescribing.

In discussing the therapy of ultra violet light with physicians who have been making use of it in their treatment of these cases, I found many instances in which they gave it as their opinion that the results were not always agreeable with what they had anticipated or had demonstrated in other instances; and that some cases showed a retrograde effect rather than one for a betterment of the condition. Further enquiry along this line in the form of a questionnaire, convinced me that wherever there had been a failure recorded that it was due to one of two things, (1) improper selection of cases and (2) faulty technic of application. A more careful canvass of the matter showed that in the major portion of answers the first condition was the principal cause for such failures. This condition is practically identical with that which followed the announcement by Rollier of the application of heliotherapy, and it was found that cases which showed a deleterious effect were not suitable for that method of treatment and never should have been given heliotherapy.

Assuming that ultra violet light is in a measure artificial sunlight, would it not be reasonable to suppose that the same conditions governing the application of heliotherapy would in a measure function in the application of ultra violet light as well, and that beneficial or untoward results could be anticipated from ultra violet light as would be expected from heliotherapy, the conditions as regards class of cases treated being identical. The answers to the question-

\*Read at sixth annual meeting, American College of Physical Therapy, November 3, 1927.

aire above referred to showed me that this postulate had not been taken into consideration by a majority of those answering, a condition which convinced me that the fault—if any—was directly chargeable to the use of the ultra violet light in cases wherein it was contra-indicated.

To clarify the situation somewhat, let me explain just what I mean to convey by the terms "indicated" and "contra-indicated." In making your selection of cases for ultra violet therapy, you can ignore—to a certain extent—the national classification, and not give much weight to such definitions as "incipient," "moderately advanced" or "far advanced," but should consider all cases as being divisible into two groups, i. e. the surgical or extrapulmonary, and second, the pulmonary cases. This latter should be subdivided into the "exudative" and the "productive types," and these should be your guide in the selection of cases for ultra violet radiation.

In the exudative type you will find that the onset usually quite dramatic. The temperature is high, there is tachycardia, loss of weight, cough and expectoration, with night sweats and the typical physical findings.

The productive type usually shows a slow and more insidious onset. The toxic symptoms are mild, cough may or may not be present, expectoration is usually absent or scanty, and there are not as a rule any night sweats. Physical examination may show large areas of involvement, moist rales, but little activity.

The following diagram, taken from Watson of Arizona<sup>1</sup> will give a better idea of this classification, and will serve as a reliable guide in the selection of cases (an exception of class five will be discussed later).

#### CLASSIFICATION OF TUBERCULOSIS

##### Extrapulmonary.

Infections of external lymph-glands, bones, joints.

Without pulmonary lesions .....	Class 1
With pulmonary lesions .....	Class 2

##### Pulmonary.

###### Productive

Childhood type tracheo- bronchial glands.....	Class 3
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Adult type .....	Class 4
Exudative .....	Class 5

#### INDICATIONS

Class 1—Use treatment in all cases.

Class 2—Use treatment in all cases, but use care to avoid reactions, and especial care in radiating chest.

Class 3—Use treatment in all cases.

Class 4—Use treatment only in cases which in spite of the best dietetic or hygienic treatment, remain stationary or lose ground.

Class 5—Never use treatment.

NOTE: A rise of temperature one hour after radiation is a danger sign. Wait a few days and begin at the beginning. Avoid irritation.

This classification in my opinion, offers the elimination of the bête noir of either heliotherapy or ultra violet therapy, in the treatment of pulmonary tuberculosis, and if the user of ultra violet light will adhere closely to this classification, his results will be exceptionally gratifying to both the patient and himself, and the untoward results which have been reported will be absent.

Results will be greatly improved by keeping a record chart of all cases, as this will enable one from day to day to estimate very closely just what progress is being made, and one can thus increase the length of exposure, distance of lamp, etc., that may be deemed expedient.

#### PATIENT'S CHART

NAME	RESIDENCE	DATE.
Temperature.		
Before exposure		
After exposure		
Pulse		
Before exposure		
After exposure		
Skin reaction		
Tanning		
Sputum (amount)		
Discharge (amount)		
Headache or dizziness		
Lassitude, fatigue, exhaustion		
Nausea		
Appetite		
Pain or discomfort in part		
General feeling		
Other symptoms		
Time of radiation		
Distance of lamp		

Time of day  
Before or after eating  
Blood picture  
W. B. C.  
R. B. C.  
Color index  
Coagulation time  
Weight

#### METHOD OF APPLICATION

The method of application is in my opinion, almost as important as the proper selection of cases, as many negative results are directly due to errors in the technic of application, and I have seen cases in which two radiations—of too long exposure—were productive of such an excessive cutaneous reaction, as to establish in the mind of the patient a dislike for further treatment, and they have refused additional radiations.

I have found that a close adherence to the technic of heliotherapy as regards time of exposure, and a use of the "zoning system" will be productive of far better results than will an indiscriminate radiation of the body from the beginning. Following the suggestion of Rollier, it has been my practice to divide the body into zones as follows: Feet to ankles, ankles to knees, knees to hips and hips to chest. The arms being radiated as they lie alongside of the body.

Using these zones, the first exposure is given in zone number one, the lamp being at a distance of twenty to forty inches from the body of the patient. This initial exposure is given for a period of one minute, front and back, and with each succeeding exposure a new zone is radiated for one minute, and the preceding zone is given one minute additional radiation.

This relationship is maintained until each zone has been covered, when a gradual increase in body radiation is given, up to a maximum of ten to thirty minutes, I have not as a rule found it expedient to exceed this latter figure—this is to apply to the radiations given with the mercury quartz lamp—with the carbon arc lamp, more prolonged radiations can be given, and the lamp placed at a greater distance from the patient.

The question of time exposure is one that should be governed largely by the nature of the

reaction produced, and there is no hard and fast rule by which one can be guided in it. The personal equation plays a very important part here, and personal idiosyncrasies will have to be taken very seriously into account. Patients who show early pigmentation can be given increased dosage more rapidly than those who redden or show a tendency to blister. These latter should be given cautious supervision, as burning should be guarded against in every case.

What has been said regarding the therapy of ultra violet light should be considered as applying to the air-cooled lamp, and has no bearing on the therapy of the water cooled lamp. The later occupies a separate and distinct field of its own, and the conditions in which it is employed make for it a therapy that is entirely different from that of the air-cooled lamp. In some cases of discharging sinuses, or in tubercular infection of the throat, vagina, nose, rectum or other orifices, the water-cooled lamp is better adapted to the needs of the case, as by means of quartz applicators, direct radiation can be given to the part affected. True, there are certain patterns of applicators or speculae, by which it is claimed that equally good results can be obtained by the use of the air-cooled lamp, but these are not generally satisfactory, and the results obtained fall far short of those secured by the water cooled lamp.

#### INFLUENCE ON CALCIUM CONTENT OF THE BLOOD

The action of ultra violet light upon the calcium content of the blood is in the nature of a stabilizer. It fixes the calcium in the blood, and restores calcium balance. It has been shown that this fixation of calcium is not a primary action, but arises as a secondary process, and is due to the energizing action of a normal calcium content, the ultra violet light will cause no increase in the blood calcium.

This property of calcium fixation, stabilization and restoration to normal in impoverished calcium states, is of great importance in the therapy of ultra violet light in tuberculosis.

As the majority of these patients show a deficiency of calcium, a condition which increases the liability to hemorrhage, as in the chemistry of coagulation, calcium is necessary, and an

absence of this element forbids normal coagulation. Also to the extent that calcium is deficient in the blood, just to such an extent is the coagulation time prolonged. It is highly probable that it is the action of the ultra violet light in fixing the calcium, or restoring it to normal, that explains its action in decreasing the coagulation time. Secondary to this may be its action in causing an increase in the white blood corpuscles.

In the table of classifications it was stated that in cases falling in class 5 it was advised not to give heliotherapy. I wish to state that this does not apply as regards ultra violet ray, as these exudative cases can be given ultra violet radiations under a very careful supervision, using either the quartz lamp or the carbon lamp, and this is especially true of children.

Gerstenberger and Burhans<sup>2</sup> state their conclusions as follows:

1. Tuberculous infants showing extensive pulmonary infiltration, even with cavity formations, may recover. Seven cases covering an observation period of from one to two years are reported.

2. It seems from the experience obtained from these infants that pulmonary exudates which are massive in character and lobar in distribution, especially are inclined to improve. The relation of the lesions in the authors' patients to the epi-tuberculosis of Eliasberg and Neuland, and the splenopneumonia of the French and Italian writers is discussed.

3. The question is raised whether the good results obtained in the type of such cases reported is not principally due to the fact that such infiltrations are a part of the beneficial immunological attack of the body against the tubercle bacillus rather than they are the results of the local success of the tubercle bacillus.

4. All of the reported patients were exposed at least three times a week to the mercury quartz lamp, and the authors believe that they were benefited thereby. *It is certain that no harm was done.*

According to Kowarschik<sup>3</sup> tuberculosis of all sorts is an indication for heliotherapy.

#### CARBON ARC LAMP VERSUS MERCURY QUARTZ LAMP

Recently considerable prominence has been given to the carbon arc lamp and the reports of its efficacy are becoming more and more numerous. That these claims are not without reasonable foundation is proved by an investigation of the possibilities of this form of generator. The carbon arc lamp has many features which will commend it to anyone who will take the time to investigate its therapeutic possibilities in the field of ultra violet therapy. Among some of these may be mentioned:

1. Having a smaller percentage of ultra violet rays—10 to 15 per cent—it can be given over longer time period without any danger of causing severe skin reactions.

2. In the case of children it is especially useful, as with the lamp at a distance of five to six feet, radiations can be given to groups of children playing on the floor.

3. Containing as it does a high percentage of the infra red rays—85%—in combination with the ultra violet rays, it is claimed that deeper penetration of the latter is obtained; some observers stating that with this combination the use of the deep therapy lamp as a forerunner of the quartz lamp is unnecessary.

#### COMPLEXION AND THE ENDOCRINES

The question of complexion is one of import and can be used as a fairly accurate guide in treatment. Brunettes can be given longer radiations as a rule than can blondes, and the red-haired blondes are even more susceptible. In this connection I have found that in some instances the exhibition of small doses of Adrenal substance to patients showing a tendency to burn, has resulted in their being able to take longer radiations without any intense cutaneous manifestations.

#### CONCLUSIONS

1. Ultra violet radiations in the treatment of tuberculosis is capable of doing great harm, and should never be used except in those cases where its indications are plainly manifest.

2. The ultra violet ray increases the calcium of the blood and stabilizes it.

3. Absorption of the rays into the blood stream causes an increase in the number of red

and white cells, the percentage of hemoglobin, and an increase of the bactericidal power of the blood.

4. The ultra violet rays cause an absorption of phosphorus and calcium from the intestine.

5. The coagulation time is shortened under ultra violet radiations.

6. There is an increased capacity on the part of the body tissues and fluids to absorb certain vitamines contained in the food.

562 Oakwood Blv'd.

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Bruns: *Jour. A. M. A.*, Dec. 20, 1924.  
Oppenheim: *Jour. A. M. A.*, Dec. 20, 1924.  
Sequira: *Jour. A. M. A.*, Nov. 10, 1923.  
Wessely: *Jour. A. M. A.*, April 19, 1924.  
Myall: *Jour. A. M. M.*, Dec. 6, 1924.  
Gerstenberger and Wahl: *Jour. A. M. A.*, Nov. 22, 1924.  
Brown: *S. W. Med. Jour.*, March 19, 1923.  
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Mayer: *Jour. A. M. A.*, Feb. 4, 1922.  
Copeland: *Am. Jour. Elec. and Rad.*, Oct., 1921.  
Negri: *Jour. A. M. A.*, Feb. 19, 1921.  
Mayer: *Jour. A. M. A.*, May 22, 1921.  
Plank: *Am. Jour. Elec. and Rad.*, April, 1921.

#### DISCUSSION

CHAIRMAN ELSOM: I would like to ask the doctor something about the fractional method of irradiation. He said he began his treatment a certain length of distance, from twenty to forty inches. If my mathematics are correct, the ultra violet irradiation, or the force of the irradiation varies inversely as the square of the distance, and consequently when he gives the treatment at twenty inches he is giving four times what he gives at forty. Is that not true, doctor?

DR. REDFIELD: Yes.

DR. REDFIELD (Closing): I have found that if far advanced cases are not too far gone it is possible to arrest the condition and bring about a much better picture of health by using the ultra violet. I sometimes give a little calcium along with it, hypodermically, or calcium by mouth, but as a rule the ultra violet radiation in far advanced cases will give you very excellent results if you will watch your case and watch your technic.

## INFECTION ABOUT THE SHOULDER\*

HERMAN WAHLIG, M. D.  
SEA CLIFF, N. Y.

A very interesting case of acute infection about the shoulder presented itself to me last December.

Mrs. B. S., age 65, widow, consulted me and complained of neuritis and rheumatism, with severe pains all over, especially in her right arm, great weakness and a very annoying cough.

*Previous History*—She said she had been ill about one year and had been on a strict meatless diet all this time, as she was being treated for rheumatism and high blood pressure.

*Present Examination*—Small, feeble, emaciated looking old woman, appearing much older than her given age. Five feet in height, skin pale, sallow and loose; hair lifeless and straggly. Eyes listless and dull. Eye-balls sunken. Tongue dry and coated, breath foul and repulsive. Teeth discolored, many decayed, gums receding and pyorrhreal. She suffered with a marked general urticaria which was very annoying, but disappeared soon after I diagnosed her case and started to treat her. She complained of a constant productive cough. Her lungs were negative anteriorly, but a few moist rales at both bases posteriorly were found. Heart-beats were rapid, sounds not clear, no murmurs. Apex in normal position.

*Abdomen*—Skin, dry and loose, due to marked loss of flesh, slightly tender in Epigastrium, elsewhere negative. The pupils reacted to light and accommodation. Reflexes were normal. The temperature was 102 F, P 120, R. 28. Bowels constipated, appetite very poor, sleep restless and of short duration on account of severe pains. She complained of severe general pains and profuse night-sweats and looked septic. At the first glance she presented the appearance of a person suffering from some hidden malignancy, especially so when one noted her age, loss of weight and general debility and weakness.

\*Read at Second Annual Meeting New England Association for Physical Therapeutics, Boston, Oct. 19, 1927.

Upon examining her right shoulder, where she said she had the worst rheumatic pains, I discovered the following condition:—A large swelling was present, which involved the joint and extended almost to the elbow, with the maximum swelling and fluctuation on the inner side. This proved to be a large abscess. The inflammation spread to the right chest and involved the pectoral muscles. An exploratory puncture was made in the center of the abscess and pus was procured for examination. The smears showed the Staphylococcus Aureus, which was verified in the cultures. Blood counts were the following:—Haemoglobin 80%; Red Corpuscle Count 4,268,268; White Corpuscle Count 21,038. Differential Count—Polymorphonuclears, 89 1-3%; Small Lymphocytes, 10 1-3% and Large Lymphocytes 1-3 of 1%.

*Urine Examination*—Specific gravity, 1022; Reaction, P. H. 4.35 (1000 x too acid); Albumen, trace; Sugar, trace; Indican, marked excess; Acetone, slight excess. Microscopical examination showed the following: Epithelia from the upper bladder and upper vagina very abundant; from middle bladder, few; pelvis and ureter, abundant and in groups; convoluted tubules, a few; pus corpuscles, 1 to 2 to field (x500); R. B. C. a few; mucus abundant; bacteria of putrefactive origin a few; a small amount of calcium oxalate and an abundance of uric acid gravel.

X ray of bone and joint were negative.

Under local anesthesia, the abscesses on inner side of right arm and in the chest were incised and about 500 cc. of pus evacuated. Drainage tubes were inserted and the wounds dressed daily. For the first ten days, she lost about 100 cc. of pus daily. Each day the patient received infra red radiation from a carbon film lamp, which treatment was followed with diathermy. Every other day, she received ultra violet radiation from a mercury vapor in quartz burner to the entire body. The ultra violet radiation was started with two minute

exposure at thirty inches distance, and then increased as was needed.

A few days after the evacuation of the pus, the temperature dropped to normal. After weeks of drainage and surgical attention the abscess cavity gradually closed. By this time the tissues around the arm, joint and chest were very stiff, tender and atrophied. To alleviate that condition, I found that the application of radiant light and heat energy for hours, and this followed with a mild sinusoidal current from a Morse generator, proved very beneficial and gave her great relief. Static brush discharge to the tender parts seemed also to be of great help. Later static sparks speeded up her recovery, by restoring the functional activities of the impaired muscles and tissues.

On account of her extreme debility from this infectious process, she was unable to see her dentist until several months later. By this time she had gotten sufficiently strong to be able to let him extract the diseased teeth. After this her general health improved markedly.

I saw this patient about two weeks ago, and she looked very well, had a fine color, her skin being clear and tanned. Her blood pressure was 130-80 and the temperature 98.6° F., pulse 72, respiration 18, bowels normal. She had gained 18 lbs.

Examination of the right arm, shoulder and chest showed excellent functional restoration. She remarked that she again had full use of her arm. She claimed never to have any more "rheumatic pains" and said that she never had felt any better in her life.

What I want to emphasize especially in this case is the great value of physiotherapy in the treatment of such a condition. The promptness with which these treatments relieved her acute symptoms during the critical stage were astonishing. I am fully convinced that the method of the treatment pursued saved her as much as 50% of her time in convalescence, and that the same favorable results would not have been obtained without the application of the physiotherapeutic measures.

#### DISCUSSION

DR. G. W. DICKINSON, (Winthrop, Mass.): It strikes me that this case was one of septicemia proven by the high percentage of polymorphonuclear leucocytes. I think the arthritis was secondary to the septicemia.

DR. WILLIAM BENHAM SNOW (New York City): The case referred to is one of the cases that cause arthritis. It is a very ideal history of a very characteristic case with an excellent result. The point Dr. Wahlig made strong was that physical measures, the use of light and the final use of the static brush discharge, brought about a very good result. The primary condition set up the arthritis. We get the arthritis from the pus.

DR. G. W. DICKINSON (Winthrop, Mass.): It seems to me that the question of diagnosis in this case is very interesting. I would like to hear it discussed more. I wonder if we get a leucocytosis from a pus arthritis.

DR. JOHN F. VALENTINE (Danvers, Mass.): My inclination is to agree with Dr. Dickinson. The patient might have obtained the arthritis afterward but I rather think primarily that it is an infection.

DR. WILLIAM BENHAM SNOW (New York City): The treatment was ideal. In the first place there is probably no measure like radiant light in helping get rid of an infection providing you can get active hyperemia where the infection is. I made a discovery during the last year that where we have an infection and get up an active hyperemia if it is in an early stage the slowing of the blood stream with the germs in the lymph spaces forces the leucocytes into the same spaces. It is really nature's help just in this respect, that by the active hyperemia that is introduced we get our phagocytosis in the tissues and with the germs in the lymph spaces the leucocytes escape right where they are. That is why I think we cure erysipelas. When I treated my first case of erysipelas with incandescent light applied for an hour and an hour off I made up my mind when he reported two days later that I was wrong in my diagnosis but subsequently we had a real case with both eyes swollen shut. We cured it in two days, two hours treatment in the morning and two hours treatment in the afternoon.

When we talk of light, penetration, dosage, candle-power, there is only one principle of dosage, skin toleration. What the skin will tolerate from any range is all you can give. If you use a five hundred candlepower lamp you treat the whole body which is unnecessary. We use a fifty candle power lamp.

DR. MARY L. H. ARNOLD SNOW (New York City): In reference to Dr. Dickinson's question, I would like to state that Hertzel in two hundred and twenty cases of extracted teeth revealed by examination that streptococcus viridans was present. Thomas Hastings in investigations along the same line showed the same condition, the presence of streptococcus viridans, so it is

possible in both chronic and infectious arthritis that we should give greater consideration to the streptococcus viridans as one of the principle causative factors and we have treated such conditions by physical measures as indicated, with beneficial results.

DR. ELMER F. OTIS (Melrose, Mass.): I do not think this paper needs any defense and so I think Dr. Wahlig is fairly safe. I do want to call your attention to one of the essential things to bear in mind, that an infectious process is a condition brought on by various factors. Some of these factors are plain enough and

some of them are quite obscure. There have been many things to consider in the causes of it and there have been many things discovered, especially the focalized infection in the pelv's and so-called disseminated focal infection, that is the general infection in the pelvis and the generative organs and in various parts of the gland structures that seem to be the cause of this infection in going out and producing the arthritis. We find that quite a large percentage of these cases are distinctively arthritic and in the large percentage we are unable to get a complete and satisfactory cure.

## EDITORIAL

### ARCHIVES OF PHYSICAL THERAPY, X-RAY, RADIUM

DISRAELI KOBAK, M. D., Editor  
Suite 820—30 North Michigan Avenue,  
Chicago, Illinois.

Original contributions, exchanges and books for review should be forwarded to the Editorial Office. All business matters including advertising should be handled through the office of the managing editor, 1216 Medical Arts Bldg., Omaha, Nebraska.

The statements made in the manuscript published in the Archives of Physical Therapy, X Ray, Radium, are made solely on the responsibility of the author. Neither the American College of Physical Therapy nor the publishers assume any responsibility for statements contained therein.

Manuscripts accepted for publication in Archives of Physical Therapy, X Ray, Radium, are for exclusive publication and may not be published elsewhere.

Subscriptions—In the United States, its possessions, and Mexico, \$5.00 yearly; Canada, \$5.50; elsewhere, \$6.50 the year.

Advertising rates on application. All advertising must conform to American Medical Association Rules.

Payments for subscriptions and advertising must be made to Archives of Physical Therapy, X Ray, Radium, in New York or Chicago Exchange.

ALBERT F. TYLER, M. D., Managing Editor

Published monthly at Omaha, Nebraska, by the Magic City Printing Company.

**Seventh Annual Meeting  
October 8-13, 1928  
Stevens Hotel,  
Chicago**

AMERICAN COLLEGE OF PHYSICAL THERAPY  
SCIENTIFIC SESSION  
JUNE 11th, 1928.  
MINNEAPOLIS, MINN.

**Hotel Radisson,**

### PROGRAM

The American College of Physical Therapy will hold a one day scientific session, June 11th, 1928, at the Hotel Radisson, Minneapolis, Minnesota. This is just prior to the active meeting of the American Medical Association. The purpose of the one day session is to stimulate greater interest in the education of physical therapy, and also to emphasize the significance and value of the application of physical agents in the various specialties.

**9 O'CLOCK A.M.**

### SYMPOSIUM ON EDUCATION IN PHYSICAL THERAPY

Physical Therapy in the Undergraduate Medical School Curriculum: D. KOBAK, M.D., Chicago.

Post-Graduate Teaching of Physical Therapy: JOHN STANLEY COULTER, M.D., Chicago.

Training of Physical Therapy Technicians: JAMES C. ELSOM, M.D., Madison, Wis.

Discussion of the foregoing papers will be in the form of an informal conference, for the purpose of establishing so far as possible, some definite standards in education in physical therapy.

Ultra Violet Radiation as a Factor in Metabolism and Nutrition: PROF. VICTOR E. LEVINE, Omaha Nebr.

2 O'CLOCK P.M.

The Present Status of Physical Therapy in Dermatology. (Lantern Slide Demonstration.): JOSEPH JORDAN ELLER, M.D., New York City.

Indications and Limitations for Physical Therapeutic Methods in Otolaryngology: A. R. HOLLENDER, M.D., Chicago.

Medical and Surgical Diathermy in Urologic Diseases: GUSTAVE KOLISCHER, M.D., Chicago.

Value of Physical Therapy in Internal Medical Diseases: GAGE CLEMENT, M.D., Duluth, Minn.

Discussion of the foregoing papers by R. W. Fouts, M.D., Omaha, Nebr.; A. D. Willmoth, M.D., Louisville, Ky.; Frank H. Walke, M.D., Shreveport, La.; J. E. G. Waddington, M.D., Detroit, Mich. and A. F. Tyler, M.D., Omaha Nebr.

Physicians desirous of acquainting themselves with some of the newer phases of physical therapeutic methods will find this one day meeting of great interest.

Fellows and visitors of the American Medical Association are cordially invited. On the evening of June 11th, there will be a college dinner and prominent leaders in physical therapy will offer addresses of special interest to all those engaged in physical therapy work.

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#### PROGRESS IN PHYSICAL THERAPY DURING THE PAST YEAR\*

Progress, like evolution, is never a product of any one moment or period of time, but is a social, economic or biologic state with periods of remissions and intermissions.

Frequently that which we call progress is the summation and the product of unrecognized labor of undiscovered sources. Again progress

often is the culmination of ideas, the inspiration of which has neither index nor bibliography.

Any period of progress is distinctly related to an established past as it is to the inevitable future, forming a connecting link between the tomorrow and the yesterday.

Progress in physical therapy, like the broader biologic conception of evolution, should be regarded as an advance not in a direct line towards an objective, but as spiral or intermittent in its path. One must realize that physical therapy has its pioneers, who, by their unsung labors have paved the way for the scientific conception of the energetics, which we now utilize in the treatment of disease.

Many, possibly most of these pioneers labored in fields unrelated to those usually trod by the medical profession. While their number is legion, only a few have their names deeply carved on the scientific monuments of many nations or chiseled into the escutcheon of seats of learning.

In the study of the progress of the medical and physical sciences one is struck by the scientific contributions that were torches of inspiration for specific medicaments or beacons to light the way for scientific discoveries by other men. We see that quite often the pupil outstrips the teacher, the apprentice the master. The pupil's reward is the laurel wreath, the master's an unknown grave.

It is but just that on this occasion we silently pay tribute to the memory of the pioneers, who, by their enthusiastic and untiring labors have brought to the attention of the medical profession the scientific possibilities of physical therapy. Indeed, they are our unknown soldiers.

Analysis of the labors in physical therapy during the year just past shows that important history has been written into the pages of this branch of medicine. A spirit of reawakening—a questioning of existing methods and assumed fundamentals—a renaissance whose force is manifest in every deliberation or written page on the subject of physical therapy is in evidence.

The literature on chemical and physical subjects today has a larger medical audience than

\*Presidential address, sixth annual meeting, American College of Physical Therapy, Chicago, Nov. 2, 1927.

## EDITORIAL

ever before. In the schools where physical therapy is part of the curriculum, the student body has become inspired to search for information and manifests a zeal no less than that which permeates our ranks.

It is a promising augury that where but yesterday disbelief verged to the point of open animosity or amused skepticism, today the spirit of honest inquiry and adoption of recognized facts has cautiously but progressively formed a solid phalanx.

Confirmation of this comes to us when no less an authority than Frank Billings but last June, while delivering his solemn convocation address to the graduates of the University of Chicago, affirmed his belief that ultra violet radiation was one of the outstanding contributions to medicine during the past decade.

At precisely the same time on an occasion equally as solemn, that distinguished surgeon, George Crile, in his convocation address to the graduates of the University of Illinois, gave expression to his conviction that great benefits may accrue from diathermy when employed as an adjunct during and after operative procedures.

It is also significant that during the past year the Journal of the American Medical Association has published a number of articles on physical therapy which bear the imprint of assiduous research and extensive clinical experience.

These and the uncounted contributions to the literature of the civilized world reflect a vast amount of labor both in the clinic and the laboratory. The contributions on diathermy are particularly significant, because they endeavor to establish or disprove the claim that this agent heats through deep structures. There can be no doubt that these researches are beginning to place the entire problem on a concrete basis, so much is already established that the energy created in the tissues is relatively superficial, because the heat is carried off by the tissue fluids and the circulation. Proof is not wanting that the temperature in the treated parts is actually raised. The labors of Binger and Christie of the Rockefeller Institute showing the deep heating effect of high frequency currents have been

corroborated by investigations made at Rush Medical College. We know today that the word diathermy has been an unhappy choice of terminology. Like with most definitions our pioneers have attempted to paint a picture and build an insurmountable mass around a choice of words. The term diathermy no longer completely defines or explains the energy absorbed into living tissue. At best it is a convenient label for identification.

Modern trend is less concerned with the problem of its through and through powers of penetration, but all the more with its effectiveness therapeutically. In this respect it actually matters very little whether diathermy penetrates merely as superficially as does ultra violet light or effects the deepest recesses of the body, for it is not the profundity of penetration *per se* but the actual therapeutic effect which is the issue. Accordingly, future research should concern itself less with penetration and more with these questions: Does diathermy influence the chemistry of the body? Does it influence the colloidal constituency of the body?

We know that diathermization of the liver and spleen is followed by an apparent influence on the blood chemistry. The early work of D'Arsonval and his collaborators indicates that the high frequency currents directly influence the protein particles of the body, as shown by observation of the colloidal behavior with diathermy and phototherapy under ultra microscopic illumination. It was but recently that personal communication with the old master himself drew attention to the colloidal phase of diathermy.

It is not only our great opportunity but also our great duty to develop additional research with an open mind, in all things pertaining to this energy. The seas of research are still uncharted and dogmatism is out of place at this time. While we have come to know a good deal about the physiologic behavior of diathermy, we are still in the dark about its physical responses, and the time is at hand to shed light on this unsettled problem. How great a role does optimum penetration play in diathermy? Is voltage the important factor? If the answer be affirmative, how are we to explain the therapeutic effective-

ness obtained in European clinics with apparatus of relatively lower voltage than those in use in America? Is frequency the important factor? Again the European models, especially those of the D'Arsonval type, tend to confirm the belief that lower frequencies than those of some American models have greater penetrating powers. Can we assume that American ingenuity has improved on the European type? All these questions await their final answer at the hands of the laboratory and our Council of Physical Therapy. We are justified in the hope that the results of these investigations will shed additional light on the uses of diathermy. All who have used this agent know that it is one of great usefulness, but its still greater spread of popularity will be due not, as has been so often hinted at, because it is an energy which lends itself to commercial exploitation, but because authoritative, scientific medicine is stamping its seal of approval as a valuable adjunct upon it.

By far the outstanding factor in the progress of physical therapy in the past year has been the active cooperation and the critical activity of the Council of Physical Therapy. It is but voicing the popular opinion to state that this Council has had and will have more to do with the placing physical therapy on a plane in keeping with its possibilities, than all the efforts of specialistic societies and organizations. The College of Physical Therapy, we feel certain, welcomes the coordinated efforts of a carefully selected group of specialistic investigators who have attained high rank and honor in their respective fields of endeavor.

The addition of physical therapy to the curriculum of many of the important medical colleges can be directly attributed to the influence of the reports and recommendations issued by the Council.

And as physical therapy receives official and academic recognition, instruction classes which in the past have been sponsored by commercial houses are becoming less evident. The scientific sentiment awakened by the Council in the ranks of the medical profession has rendered superfluous the itinerant teacher who tried to arouse the interest of the profession to the value of physical therapy. And this constitutes ad-

vance, because while that kind of work was both constructive and effective under the old regime, it lacked the scientific quality to inspire confidence.

Although a specific teaching standard has not yet been adopted in the medical schools, we nevertheless note varying degrees of emphasis on the background of this discipline, by constructing about it an exposition of the forces that govern life. Life was formerly regarded as a phenomenon entirely separated from the other phenomena of nature. Today the medical student learns to appreciate that living things are made up of the same chemical elements as those of the inorganic world, and represent arenas of the same physical forces which effect the mineral world. Recent advances in many branches of scientific research have emphasized the essential unity of all the sciences in the struggle to unfold the mysteries of life and nature. Biology, biochemistry, physical chemistry and pure physics deal fundamentally with the same laws, and it is becoming more and more difficult to define the region peculiar to each. Biophysics is the specific pedagogic background in relation to physical therapy, and few specialties exhibit a greater necessity for such a background on account of the great ramification of the fundamental energies that enter into this work. Such is our impression of the importance of biophysics for a better appreciation and understanding of physical therapy that at Rush Medical College we are devoting to it one fourth of the teaching period of this specialty.

The University of Chicago at the present time offers a popular course called the Natures of the World and of Man, which justly could be called popular biophysics. This teaching symposium by its learned faculty has met with such popular favor as to cause its publication in book form.

In the recommendation of the study of biophysics preparatory to clinical physical therapy, the Council has manifested a broad vision which will enable the future practitioner more intelligently to make use of the energies under consideration.

What of the progress in phototherapy with its refined divisions into infra-red, luminous and

the ultra violet spectra? The widespread confusion that has existed concerning these electromagnetic waves designated as infra red or heat producing generators is positive evidence of the lack of exact knowledge in the past. Information on this energy varies from the most picturesque description of its usefulness to the most acrid criticism of its uselessness. The clinical effects vary with the degree of enthusiasm of those who make use of it therapeutically, so that we behold its loyal champions opposed by relentless critics. Its penetration is either stupendous or infinitesimal according to where the voice comes from. With such a wide disproportion of claims it is usually safe to take a mid course and to adopt the slogan of watchful waiting until an authoritative verdict is brought in. Further confusion is seen in the popular belief that heat from a radiant lamp is identical with that of an infra red generator. This, however, is untrue. As regards infra red therapy proper, European research, notably the labors by Henri, which have been partly verified by us in the laboratory, seems to promise unexpected usefulness. We know already that the radiant energy from an infra red generator has photothermic properties and photochemical possibilities. Further proof for this will be presented in the not too distant future.

Our information on the effect of luminous rays outside of their heat producing properties is as barren today as it was decades ago. Progress beyond what was established by Finsen in the early nineties has been virtually nil. Accordingly, the problem of the future must deal with the exploration of the spectral region for inherent effects other than optical and psychic stimulation. In the perfection of the neon tube we have the means of studying the separate colors without the influence of the previously associated heat rays.

Of all the energies utilized in physical therapy today ultra violet radiation appears to enjoy the greatest popularity. It is not only employed more extensively than the other physical measures, but has been accepted by the general profession as a scientific adjuvant of decided power in the treatment of disease. Investigation with this energy is being carried out in public, endowed and private laboratories. As

was already alluded to, ultra violet radiation is today considered one of the important contributions to medicine. It is an accepted fact that it has a decided influence on the hemopoietic system. It is established beyond doubt that it influences the phosphorus and calcium content of the blood. It is certain that ultra violet radiation is responsible for the activation of vitamin D. Proof that it also effects the iron metabolism of the blood is being submitted, and once this is verified it will be of equal if not greater importance than its influence on the spasmophilias and rachitis, for the problem of the anemias is of vast importance to mankind. The labors of Hess claiming that the therapeutic effect of ultra violet radiation is due to its activation of cholesterol have been negated partly by the very same author, who, in a more recently published account maintains that pure cholesterol is not activated by ultra violet radiation, but that it is an associated product—ergosterol—that really is activated. We see, therefore, that the problem of specific body activation is still an open one.

Special impetus has been given to the investigation of ultra violet radiation of food. Steenbock's work in this problem has apparently fired the imagination of the manufacturers of food products. Certainly it has been found that ultra violet radiation exerts a profound physiologic effect which tremendously activates inert food products. The possibilities of these investigations are far reaching and verify the old truth that sunshine, natural or artificial, not only influences animal, but also vegetable life.

The ever restless spirit of research is carrying us today beyond the ultra violet region. Much can be hoped for from the completion of an instrument which delivers energies in the spectral region below the x rays. These rays, named by the Germans "Grenz," or borderline rays, are best designated as infra x rays. The penetration of these rays is limited to the entire structure of the skin, and the erythema resulting from their application is distinctly different from ultra violet radiation by deeper penetration and stimulation, and from the x rays by a more superficial effect. But these rays have not only a local but also a systemic effect and influence the deeper organs of the body as well

as the dyscrasias of the skin. These rays have the advantage of being free from injurious effects and are therefore physiologically stimulating in character. We have, then, in these rays a more profound influence than can be had with ultra violet radiation and a lesser but also less harmful effect than is experienced with the x rays.

Gustav Bucky, the pioneer investigator of these rays, has made a contribution to science which may yet bring him undying fame, for the field of research with this new energy is unlimited, and those who are qualified for such investigations have immeasurable opportunities for good.

It is with mixed feelings that we note greater activity in the physiological laboratory with the galvanic and faradic currents, which, in the past decade have been treated in rather stepmotherly fashion, even by our specialistic societies.

But this lack of enthusiasm for the low frequency currents is undoubtedly due to lack of appreciation of their physiologic utility. The work done with kinographic tracings of impulses on the sartorius of the frog nearly shows that these currents have diagnostic value, and a revival of interest is urged on all. Any one of the concerned energies, be it the true galvanic, the faradic or sinusoidal current merits critical investigation. A fruitful field is promised by investigations, to cite an example, whether contraction of an abdominal muscle or group of muscles affects contractions of the deeper viscera. Tonic medication and intercellular massage require further research. We are justified to undertake such labors because we have cumulative evidence of clinical effectiveness of the low frequency currents.

In conclusion we may be permitted to give expression to a note of optimism based on close study and analysis. Physical therapy as guided by the Council of Physical therapy and as moved by the spirit of our times is about to attain higher objectives. It is already gaining a decided foothold in the most conservative ranks of our profession and will in the near future be generally accepted as a scientific discipline of medi-

cine and surgery the same as the classic methods, for the common good of mankind.

—Disraeli Kobak.

#### WESTERN ASSOCIATION OF PHYSICAL THERAPY

The Tenth Annual Meeting of this Association was held at Hotel President, Kansas City, Mo., April 20 and 21, under the presidency of Dr. J. E. G. Waddington of Detroit. An interesting program of twenty-five papers held the interest of the large number of physicians in attendance. The guests at the annual dinner included; Drs. W. B. Snow, Mary Arnold Snow, New York; Frank Walke, Shreveport, President-elect American Congress of Physical Therapy; Kerwin W. Kinard, President Jackson County Medical Society; James T. Case, Battle Creek; Henry Schmidt, A. R. Hollender, Disraeli Kobak, Chicago; Roy W. Fouts, A. F. Tyler, Omaha, and Richard L. Sutton, Kansas City, who presented a most interesting lantern talk on "Africa and the Big Game."

The following officers were elected for the ensuing year;

President—E. N. Kime, M.D., Indianapolis, Indiana.

First Vice-President—W. P. Grimes, M.D., Kansas City Mo.

Second Vice-President—A. F. Tyler, M.D., Omaha, Nebr.

Secretary—Charles Wood Fassett, M.D., Kansas City, Mo.

Treasurer—F. L. Laffoon, M.D., Kansas City, Mo.

Registrar—J. T. Stamey, M.D., St. Joseph, Mo.

Trustees—J. E. G. Waddington, M.D., Detroit, Mich.; F. H. Morse, M.D., Boston Mass.

# THE STUDENT'S LIBRARY

## BOOKS RECEIVED

This column is devoted to acknowledgment of the books received. Such acknowledgment must be regarded by the sender as sufficient recognition of the courtesy until time and space permit selections to be made for review.

PRACTICAL DIETETICS IN HEALTH AND DISEASE. *Sanford Blum*, A.B., M.S., M.D., Head of Department of Pediatrics, and Dir. Research Lab., San Francisco Polyclinic and Post Grad. School. Third Revised and Enlarged edition. 380 Pp. F. A. Davis Company, Philadelphia, Publishers.

DIABETES AND ITS TREATMENT BY INSULIN IN DIET. By *Orland H. Petty*, M.D., Prof. of Dis. of Met. Grad. School of Med., University of Pennsylvania. Physician in charge of Department of Diseases of Met., Phila. Gen. Hospital. With an introductory foreword by John B. Deaver, M.D. 152 Pp. Illustrated. F. A. Davis Company, Philadelphia, Publishers.

EINSTELLUNG ZUR ROENTGENOLOGIE—EINE UNTERSUCHUNG UBER DIE EINFUGUNG DER ROENTGENSTRAHLENWENDUNG IN PRAXIX, FORSCHUNG UND UNTERRICHT. By *Von Prof. Dr. G. Holzknecht*. 115 Pp. Wien, Austria. Verlag Von Julius Springer, Publisher. 1927.

HANDBUCH DER LICHTTHERAPIE. Unter Mitarbeit Von *O. Bernhard*, St. Moritz. *O. Chievitz*, Kopenhagen. *F. M. Exner*, Wien. *F. Hauer*, Wien. *W. Hausmann*, Wien. *K. Huldschinsky*, Berlin. *E. Lang*, Erlangen. *A. Laqueur*, Berlin. *G. Politzer*, Wien. *L. Schonbauer*, Wien. *J. Sorgo*, Wien. *O. Strandberg*, Kopenhagen. *J. Urbanek*, Wien. *R. Volk*, Wien. *C. H. Wurtzen*, Kopenhagen. Herausgegeben Von *W. Haussman und R. Volk*. Mit 106 Abbildungen und 36 Tabellen im text. Wein, Austria, Verlag Von Julius Springer, 1927.

A TEXT BOOK OF ACTINOTHERAPY. By *D. D. Rosewarne*, M.R.C.S. (Eng.), L.R.C.P. (Lond.).

Late Hon. Actino-Therapeutist and Asst. Physician, City of London and East London Dispensary, etc. With 20 illustrations, including a colored plate. 230 Pp. St. Louis, Mo., C. V. Mosby Company.

DISEASES OF THE NOSE, THROAT AND EAR. By *W. S. Syme*, M.D., F.R.F.P. and S.G., F. R. S. E. Lecturer on Diseases of the Throat and Nose, Glasgow Univ.; Surg. for Diseases of the Throat and Nose, Western Infirmary, Glasgow; Surgeon, Ear, Nose and Throat Hospital, Glasgow; Consulting Aurist and Laryngologist, Royal Hospital for Sick Children, Glasgow, etc. Pp. 395. Illustrated. Second Edition. William Wood & Co., New York City, Publishers.

DISEASES OF THE EAR. By *Richard Lake*, F.R.C.S., Eng.; Consulting Surg., Royal Ear Hosp. (Uni. Col. Hosp.); Duvern Lecturer in Otology, Uni. of London and *E. A. Peters*, M.D., Cantab., F.R.C.S., Eng.; Surg. Royal Ear Hosp. (Uni. Col. Hosp. Fifth Edition. 310 Pp. Illustrated. William Wood and Company, New York, publishers.

DISEASES OF THE MOUTH. *Sterling V. Mead*, D.D.S., Prof. Oral Surg and Diseases of the Mouth, Georgetown Dental School, etc. With 274 original illustrations in the text and 31 full page color plates. Second Edition. 578 Pp. The C. V. Mosby Co., St. Louis, Publishers.

THE CURRENT SIGNIFICANCE OF THE WORD ALUM. By *William D. Richardson*, Former Ed., Industrial Engineering Chem., etc. 8 vo. Cloth. 93 Pp. Chicago: Commonwealth Press, 1927.

## BOOKS REVIEWED

OTOLOGIC SURGERY. By *Samuel J. Kopetzky*, M.D., F.A.C.S. Professor of Otolaryngology, Polyclinic Medical School and Hospital, New York; Director, Dept. of Otolaryngology, Beth Israel Hospital, N. Y., etc. 102 Illustrations, including 4 color plates; 21 charts. Paul B. Hoeber, Inc., New York, 1925.

This volume was compiled primarily to place the experience and knowledge gained during the past fifteen years at the disposal of those interested in aural disease. The author, whose years of close contact with the specialty has well equipped him to lend a personal touch in such a compilation, has endeavored to provide a

source of information and reference for the general practitioner and the student as well as for the otologist.

The twelve chapters cover the subject comprehensively. The mastoid operation, simple and radical, is enlarged upon with a style which is clear and understandable and sufficiently detailed to afford information for the most experienced specialist. The surgery of the labyrinth, sinus thrombosis and the surgery of the meninges are other subjects dealt with systematically, not a single worth while procedure of modern development being omitted.

The chapter on laboratory aids to otological diagnosis and the final chapter giving specific case reports with comments is sufficiently different from the average volume to be individual and unusual.

The text is rather well illustrated. The charts are distinct aids for study, while the bibliography references show the comprehensiveness of the preparation entailed in this complete review of the subject of otologic surgery.

**MANUAL OF THE DISEASES OF THE EYE—FOR STUDENTS AND GENERAL PRACTITIONERS** By *Charles H. May*, M.D., Director and Visiting Surgeon, Eye Service, Bellevue Hospital, New York, 1916 to 1926; Consulting Ophthalmologist to the Mount Sinai Hospital, to the French Hospital, to the Italian Hospital, New York, and to the Monmouth Memorial Hospital; Formerly Chief of Clinic and Instructor in Ophthalmology, College of Physicians and Surgeons, Medical Department, Columbia University, New York. Twelfth Edition, Revised. With 374 original illustrations including 23 plates, with 73 colored figures. William Wood and Company, New York, 1927.

Although in its twelfth edition and continued up to date in every detail, with constant revisions, this volume has not been increased in size. As was originally intended this still remains a concise, practical and systematic Manual of the Diseases of the Eye, for the student and the general practitioner of medicine. It has been extremely popular with the medical student and has served as an efficient reference text for the busy practitioner. All phases of diseases of the eye are considered and the more important diseases such as glaucoma sufficiently emphasized and detailed. The chapters on general optical principles and refraction are especially noteworthy and give as much information in few pages as is usually given in separate volumes. One must speak favorably also of the chapter on ocular therapeutics which includes the general rules for eye operations. The final chapter on ocular manifestations of general diseases is an important one and con-

veys information which every clinician should from time to time review.

As in previous editions the illustrations, colored and otherwise, are of material assistance in bringing to the student that which the experienced and busy ophthalmologist is able to observe in his clinic and private practice.

While other volumes on the eye will no doubt appear from time to time, this one has set a certain standard which will be difficult to overcome by books of a similar size.

**HANDBOOK OF DISEASES OF THE EAR, FOR THE USE OF STUDENTS AND PRACTITIONERS.** By *Richard Lake*, F.R.C.S., Eng., Consulting Surgeon, Royal Ear Hospital (University College Hospital); Duveen Lecturer in Otology, University of London, and *E. A. Peters*, M.D., Cantab., F.R.C.S., Eng. Surgeon Royal Ear Hospital (University College Hospital); Surgeon, Nose, Throat and Ear Department, Bolingbroke Hospital Fifth Edition. New York: William Wood and Company, 1927.

The fourth edition of this book appeared in 1912. Dr Lake has assisted in bringing the fifth edition right up to date. The additions comprise a brief description of the functions of the cochlea and of the static and kinetic labyrinth and the diseases affecting the labyrinth. Some of the additions made include "Other Modern Aspects of Aural Disease and Treatment," which the authors have attempted to deal with in a definite and succinct fashion.

There are fifteen chapters systematically arranged to cover the subject. Some of them, on account of the limited space devoted to such an extensive subject, are too sparing in material, yet in all, the style is good and somewhat different from that of other books on otology. The chapter on Special Symptoms and Their Import is of decided interest and value to students and practitioners. Chapter V on the Estimation of the Acuteness of Hearing is also well written and quite comprehensive in scope.

There is little or no mention made of the use of physical agents in therapy. One paragraph is devoted to Friel's method of zinc ionization for chronic suppurative otitis media, scarcely enough for the amount of work done along these lines by Friel and other English aurists. The book is well indexed. The mechanical make-up is excellent.

# INTERNATIONAL ABSTRACTS

## **Increasing the Quantity of Milk in Nursing Mothers by Means of Ultra Violet. Prof. Stolte and Breslau Weiner. Deut. Med. Woch., Vol. 54, Feb. 17, 1928. No. 7. P. 259.**

Stolte and Wiener report an increase in milk secretion to follow local exposure of breasts to ultra violet rays and heat lamps. Daily treatments, first from five to seven minutes, were gradually increased to 25 to 45 minutes at a distance of 80-c.m. gradually reduced 60 c.m. After the increase in milk secretion was definite, this taking one or two weeks, the interval of treatments were gradually lengthened to a minimum of twice a week. Before each treatment, the breast was entirely emptied by the infant, or if necessary, additional breast pumping. No bad results were seen in a series of twenty cases.

## **Surgical Diathermy in Breast Cancer: Application of Arc Electrode or Cutting Current to Radical Operation. J. Anderson, Brit. J. of Surgery, January, 1928.**

Of fifty-six cases of carcinoma of the breast excised by the arc electrode (1923-1926), Anderson reports that forty-three patients are alive and apparently well. Thirty of these had glandular metastases at the time of operation. There has been no case of simple local recurrence; but two patients, in whom the disease was found at operation to be beyond the range of excision, ultimately died of diffuse general metastasis with local and general nodules. There has been only one case of appreciable edema of the arm, and in this case malignant glands were found adherent to the axillary vessels and nerves. The edema has now receded and the patient appears well. There was no case of secondary hemorrhage or of protein shock.

## **Actinotherapy in Psoriasis. L. Marceron, Paris Medical, January 21, 1928.**

An intense erythema caused by light rays acts very favorably on psoriasis. The rays of the sun may be used, but the most practical source of short rays is the mercury vapor quartz lamp. Because of the pain, only a limited surface should be exposed at one time. The patients should be advised of the pigmentation which will follow exposure. Usually it suffices to produce a severe erythema twice in succession over one area to free it of all lesions of psoriasis. If some small actino-resistant points of psoriasis remain these may be got rid of with a chloroform solution of guttapercha-containing chrysarobin.

## **Electrocoagulation of Accessible Malignant and Non-Malignant Growths, John Aspray, M. D., Northwest Medicine, March, 1928.**

According to the author, this method of treatment offers the best prognosis when it is used primarily, but it may be of some value where other therapy has failed. Neither electrodesiccation nor electro-coagulation is comparable to the use of the actual cautery, since neither of them, properly used, should produce charring.

Different factors between desiccation and coagulation are given in detail as are also the appropriateness of each for definite indications. The subject of anesthesia is discussed. Several illustrations appear in the paper. Seven case reports are cited.

Summarizing the facts, Aspray states, "Electrothermic methods are those of choice in certain types of new growths on the surface of the body and in practically all accessible cavities. The wounds remain open after the operation and thus permit better drainage. The blood vessels and lymphatics are blocked by the coagulation, thus lessening or preventing metastases as well as decreasing the absorption of toxins. The nerve destruction produces relief or complete absence of pain. In the more advanced cases coagulation may be used to control hemorrhage and in preparation for possible radiation therapy. If there are recurrent granulations later, they can be given further electrodesiccation, electrocoagulation, or radiation with radium or x ray."

## **The Use of the D'Arsonval Current in the Removal of Tonsils, Julian Buff, M. D., The J. of the M. Ass'n. of Georgia, Febr., 1928.**

Buff recalls the method as advocated a few years ago by Hollender and Cottle of Chicago. Their method is described as it has appeared in the literature from time to time. Buff believes that the method was abandoned for the reason that it caused too much tissue coagulation at the lower pole, and in the tonsil fossa. The current traveling from one electrode to the other, does not pass out of the upper part of the wire which is the electrode the same as it does out of the lower part. This is due to the fact that the density is not the same and a current passing out of the upper pole of the wire has a much greater distance to travel than that which passes out of the lower pole.

The author's method is somewhat different and is described thus; The patient is anesthetized in the ordin-

ary way and the cone and ether removed from the room. The tonsil is engaged in the detachable loop and the detachable ring removed from around the tonsil. This leaves the tonsil caught in the wire loop, a number four wire preferably, of a Beck instrument with the wire insulated down to the tonsil with hard rubber.

The wire of a high frequency current machine is attached to the Beck instrument. The tonsil is caught with a pair of insulated forceps except the tip which serves as the active pole, and then the current turned on with a foot switch. The wire in the Beck instrument is pulled taut until the tonsil is removed. The operation requires about three or four seconds, using two or three hundred milliamperes of current. The opposite tonsil is removed with the same procedure. Under local anesthesia the operation is similar in every way.

It is claimed by the author that the tonsillar fossa is less affected by his technic so far as devitalization of tissue is concerned, burning, etc. The usual advantages of electrocoagulation are mentioned. These are absence of bleeding, rapid healing, a lesser amount of scar tissue, sealing of lymphatics, and simplicity and speed of operation in the hands of one thoroughly experienced in Beck's technic of tonsillectomy.

Emphasis is laid on the necessity of good apparatus, a familiarity with diathermy technic and the general cautionary measures regarding ether anesthesia in the presence of surgical diathermy.

#### **Values of Physical Therapy in the Clinic, J. C. Elsom, M. D., Am. J. of Surgery, February, 1928.**

The bactericidal effects of heat and light are well known, and in physical therapy are found effective weapons for combating disease, and hastening the process of repair. Medical and surgical diathermy are defined. The status of active and passive massage is detailed. Massage is really a form of passive exercise, and although it does not take the place of active exercise, it fills a need in a large group of cases.

The physical therapy in cases of fractures has been one of the outstanding methods in modern surgical practice, and is certainly radically different from the methods of even a generation ago.

Among painful inflammatory conditions which are benefitted by radiant heat and light and diathermy are (1) myositis, heat and massage seem especially indicated; (2) synovitis and bursitis, diathermy, with electrodes placed as nearly as possible on opposite sides of a limb, is a valuable form of treatment; (3) orchitis and epididymitis, diathermy with the Corbus scrotal electrode seems to give marked relief in most cases; (4) arthritis, the traumatic type seems to respond more readily than the chronic type of hypertrophic arthritis,

but even in the latter, improvement results if possible foci of infection are removed. Relief from pain and greater mobility of joints usually follow after a course of diathermy.

Sprains respond well to radiant heat and light and diathermy, followed by massage. The ultra violet rays from the mercury arc are of decided value in the treatment of many dermatologic conditions. General body irradiation has apparently a very tonic effect, increasing and fixing the calcium and phosphorus content of the blood. None of the methods is a panacea, but simply a means of assisting nature in the process of repair.

#### **Electrodiathermy—Its Use in the Treatment of Benign and Malignant Lesions of the Uterine Cervix, Frank M. Mikels, M. D., Cal. and Western Med., January, 1928.**

Mikels surveys the subject at length, emphasizing the use of what he calls electrodiathermy in the treatment of benign and malignant lesions of the uterine cervix. The technic which he employs is described. Plank's electrode has proved most satisfactory.

The treatment of endocervicitis is discussed as is also that of neoplasms, erosions and other conditions. The contra-indications for electrothermic destruction of abnormal lesions in the cervical region are the same as they would be in any other part of the body.

The author does not believe that it would be precarious to use electrodiathermy on the cervix of a pregnant uterus when this form of treatment is used with due care and precaution. It is believed that electrothermic treatment of lesions of the uterine cervix is more efficacious than topical medical applications. It does not interfere with plastic operations for the repair of extensive lacerations, but leaves a cleaner field for these procedures. Diathermic methods of obstinate neisserian infection of the uterine cervical mucosa, cervical erosions and the adjacent inflammatory tissue.

#### **Actinotherapy at the Finsen Institute, Copenhagen, Axel Reyn, M. D., The Brit. J. of Tuberculosis, January, 1928.**

Finsen realized that if light was to become of any real practical value, it would be necessary to substitute an artificial source of light for that of the sun, because in northern countries of no elevation to speak of—like Denmark—the latter is far too uncertain. As a substitute for the sun, Finsen chose the electric carbon arc light, which, like the sun, has a continuous spectrum showing strong lines in the long-waved ultra violet rays. And as a result of his investigations into the biological effects of light, Finsen suggested using the concentrated chemical light for local treatment for diseases of the skin, and fistulous cases of glandular and surgical tuberculosis. The general light-treatment—the "light-bath"—is used for various forms of surgical tubercu-

losis for laryngeal and for certain cases of pulmonary tuberculosis.

Reyn insists on the superiority of the carbon arc and employs it in every instance, except for those patients who, for some reason or other, cannot support the heat given off by the carbon arc. The description of Reyn's lamps are given. The results obtained in surgical tuberculosis at the Finsen Institute are almost equally as good as those obtained in Switzerland by Bernhardt and Rollier, notwithstanding the fact most cases have been out-patients coming and going from very poor homes, where they lived under anything but hygienic conditions. While the light-bath is one element, there are other additional methods at our disposal and all these should be brought into play.

Attention is directed to the more general adoption of light-bath therapy in cases of pulmonary tuberculosis. Reyn believes that the stimulating effect which the light-bath has on the organism must be extremely helpful.

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**Physiological Effects of Heat, Wm. T. Johnson, M. D., Physical Therapeutics, January, 1928.**

The generally accepted conclusions regarding the effects of external heat upon the human body as summarized recently by Pemberton are quoted in this article and discussed by the author.

The amount of internal heat developed during diathermic administration has, however, been questioned, and the conclusions indicate that less actual deep heating occurs than has been claimed by many. This was to have been expected. Dissipation of heat through contiguous structures and the circulation in living tissues makes it unreasonable to suppose that the greatest heating occurs far below the electrodes. The augmentation of circulation that tempers the heat is itself a leading factor in the clinical response to diathermy. Various results are doubtless related to differences in apparatus. Critical tests of different high frequency coils should soon make it possible definitely to determine the preferable type for a given purpose.

According to Johnson, it would seem that the effects of heat must be studied in relation to its source, and that these investigations should deal with four types of heat source, viz:

1. Applications of air or water at varying temperatures;
2. Infra red heat, i. e., radiant heat minus visible light;
3. Radiant light and heat;
4. Diathermy.

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**Educational Courses in Physical Therapy, A. B. Hirsh, M. D., Physical Therapeutics, January, 1928.**

It is suggested that tentative means be effected for college and hospital instruction in approved physical

treatment methods. This will apply to that (1) for the medical undergraduate; (2) for the practicing doctor and (3) for the non-medical assistant.

The ideal education in physical therapy of the medical practitioner, to be thorough, should begin in the undergraduate school—just the same as for pharmaceutical remedies and for medicine and surgery in general. There are various views discussed relative to this more or less accepted contention as advocated by the Council on Physical Therapy of the American Medical Association.

Meanwhile there is a growing disposition by educators to lighten the entire undergraduate load by including in it only a general view of all the various specialties, physical methods among them. Then more complete knowledge of these branches would be imparted during the interne year, supplemented by post-graduate courses, medical meetings and seminars. The feasibility of such undergraduate courses have been shown by several clinicians and teachers, and an outline of such undergraduate courses, in a number of medical schools are given.

The post graduate study of physical therapy is enlarged upon, holding with the American Medical Association regarding the scope of this phase of the subject. The training of physical therapy technicians also comprises a large part of the discussion. Granger's three plans for training nonmedical physical therapy technicians are cited. Other plans as utilized in several special instances are given by way of suggestion.

(This is a report of the Committee on Education in Physical Therapy, of the American Electrotherapeutic Association, of which Dr. A. Bern Hirsch was chairman. The report in full was read at the Annual Meeting of the Association, New York City, September 15, 1927.)

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**Excision of Prostatic Bar by the Cutting Current, Clyde W. Collings, M. D., Physical Therapeutics, January, 1928.**

During a period of four and one-half years at the Bellevue Hospital and New York University, Collings has relieved fibrous obstructions at the bladder neck by the cutting high frequency current in fifty-five patients. The operation is employed on three types of bladder neck obstruction; (1) fibrous contracture and bar (congenital and acquired), (2) fibrous scar following prostatectomy and (3) carcinomatous bar resulting from a carcinoma of the prostate.

The cutting high frequency current will efficiently excise fibrous, scar and carcinomatous tissue at the bladder neck. As has been stated fifty-five patients have been relieved of the bladder neck obstructions by this *direct vision method*. Two patients died of pneumonia, one of carcinomatosis, and of two there is no record of the present residuum.

The current cuts instead of burning; hence there is no thick slough to separate off and no secondary hemorrhage. Primary bleeding has never been more than

enough to make the urine sherry colored with small clots at times. This procedure changes the operative risk from *major* to *minor*, or the difference between a suprapubic cystotomy and a cystoscopy.

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**Medical Aspects of Heat, Mark W. Peyer, M.D., Virginia Med. Monthly, March, 1928.**

The greatest resistance to the inward passage of heat is the skin, but this resistance may be lessened by a combination with moisture, or it may be almost entirely overcome by moisture plus a higher form of energy which is converted into heat by the resistance of the deeper organs and tissues.

The manifestations of the action of heat are enumerated. The therapeutic aspects include effects from local and general applications. The methods of applying local heat from various sources are stated by the authors, finally leading up to the different types of high frequency currents. The latter have been advantageously employed in infections of all sorts, pneumonia and for the destruction of cancer tissue.

Infra red rays are next to that of diathermy in penetrative power. Indications for its use are the same as for diathermy.

Heat may be applied generally by means of water and vapor baths, plain or medicated, air baths and auto-condensation. A method of administering heat to the bedfast patient is the electric blanket which can be placed in the bed and snugly wrapped around the patient.

Shock after injury, chilling after exposure, or collapse from loss of blood or other conditions, may be successfully combated by general exposure to heat generated by hot bricks or hot water bottles placed alongside of the patient. Or he may be placed in bed, snugly wrapped in blankets drawn close about the neck, and heat, generated on the floor by alcohol lamps or otherwise, introduced beneath the covers by a pipe; or he may be placed in the body baking apparatus or wrapped in the electric blanket.

Some facts regarding cold are given. Cold as a therapeutic agent is beneficial in two classes of cases; (1) where it is desired to affect the organs and tissues of the part and (2) where it is sought to lower general temperature, as in the hyperpyrexia of typhoid and scarlet fevers, and sunstroke, using it as antipyretic.

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**Fundamentals of Electromedical Technic, G. Oppenheim, Deutsche Medizinische Wochenschrift, No. 54, 5, February 3, 1928.**

The generation of galvani currents, or constant current, is of considerable importance in electrodiagnosis and electrotherapy. The transition from the old galvanic battery to the modern junction apparatus of the pantostat type, indicates considerable progress relative to safety, but regression relative to the quality of the galvanic current. The galvanic current generated by

this apparatus is really not a galvanic current, but a rather irregular pulsating current. This defect is especially evident in the treatment of neuralgias and in the use of the galvanic current for finer diagnostic purposes. The poor quality of the dynamo current is determined by testing with the telephone, by means of which irregular sounds are heard, whereas, the real constant current does not give rise to any sounds in the telephone. Radiotechnic has shown the correct way of generating such real galvanic currents by the use of the alternating current net. The straight tubes used in the radio industry, yield, when joined with the alternating current, connected with condensors and resistance spools, a constant current which is not audible in the telephone. This corresponds to the requirements of electromedical purposes Oppenheim demonstrated such an apparatus of his own construction at the Frankfort Medical Society Meeting, December 5, 1927. Its safety, reliability and its many applications have been proven practically.

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**Principles and Significance of Modern Red Light Therapy, A. Landeker, Die Medizinische Welt, No. 4, January 28, 1928.**

Red light irradiation is best done with the medical neon lamp, the light of which is emitted through colorless glass across a complete monochromatic red. The therapeutic value of the neon lamp lies in its analgesic, sedative, antileucocytic and anti-inflammatory effect. The irradiations can be applied locally or generally. General irradiation is an effectual therapeutic method in the amelioration of neurasthenic conditions, nervous insomnia and irritability states. In addition, it is also indicated in organic neuroses without an evident basis such as stomach, intestinal and heart neuroses. General red light irradiation was very successful in the treatment of tetany, spasmodophilia, headache and migraine.

Local irradiation is very efficacious in the treatment of certain skin diseases, particularly in very moist, intertrigous eczemas, furuncles and pyodermes in the early stages. It is also a good method for the amelioration of skin irritation following too intensive application of quartz or sun light. It is particularly indicated in eczemas with severe vesicular formation and the best results are obtained in the forms which appear periodically spring or summer. Every form of pruritus or suppurative skin inflammation is affected favorably. Intravaginal application of neon light is successful in many forms of lumbago and sciatica.

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**Roentgenography in Basedow's Disease, Paul Krause, Strahlenther, No. 27, 3, 1927.**

Roentgen ray treatment is indicated in the acute forms of Basedow's disease which show symptoms of intoxication. The irradiations should be conducted very carefully and the single doses should be between 10 and 20%. In the distinct forms of the disease without tracheal compression, radiation is the method of choice.

## ABSTRACTS

**Neurathenia on a thyrotoxic basis, combined with goiter, is affected favorably by smaller Roentgen doses.** In the preclimacteric symptoms of women, Roentgen irradiation of the thyroid and also of the ovaries when necessary is a better therapeutic method than organotherapy. The treatment consists in separate irradiation of the right and left thyroid lobes with intervals of two to three days. The combined dose on a single field amounts to about 30 to 60%. There should be an interval of four to eight weeks before the next irradiation. In successful irradiations the intervals should be longer. In acute cases the thymus irradiation should not be begun until after the acute symptoms have subsided. The size of the thymus field is 6 to 8 cm. "In mild forms of the disease the irradiation can be run up to 80% of the single field on both thymus and thyroid. The interval is at first four to twelve weeks and is later increased up to one-half year.

**Treatment of Severe Cases of Infantile Paralysis, M. Bohm, Die Medizinische Welt, No. 4, January 28, 1928.**

Treatment should be begun immediately after subsidence of the acute symptoms and should continue during the entire healing stage. The goal of treatment should be the prevention of contractures and deformities. Prevention of fractures is accomplished by easily removable splints. The paralyzed limbs should be immobilized in a neutral physiological position. The foot is fixed perpendicularly avoiding flat foot and also club foot. One hundred seventy to 180 degrees is the best position for the knee joint. In this way the development of abnormally fixed positions is avoided such as genu flexum, recurvatum, varum or valgum. The hip should be fixed in a middle position. All types of movements whether it be internal or external rotation, flexion or extension, abduction or adduction, should be limited in extent.

The immobilization of a paralyzed shoulder joint is best done in abduction and external rotation. The elbow is fixed in flexion at right angles and in mid position between pronation and supination. The wrist is extended to about 30 degrees. It is, unfortunately, too often overlooked that the spinal column, also, undergoes contractures as a result of paralysis of the back muscles. A plaster of paris cast is used.

In addition to splints the patients should perform certain exercises designed to prevent contractures. The paralyzed muscles, however, should not be overstretched. Heat and salt baths are good adjuvant therapeutic methods. Good results are also obtained from careful massage, electric treatment and diathermy of the spinal column, in the early stages of the disease.

**Experiments with Roentgen Irradiation in Acute Inflammations, O. Seemann, Beitrage Zur Klinischen Chirurgie, 141, No. 3-4, 1927.**

The author has reached the following conclusions from his experience with 171 cases. The most gratifying

results are obtained in coccal infections, such as facial furuncles. Inflammations of sweat glands, paranephritic or lymphangitic infiltrations, angina phlegmonosa, parodenteses, parametric inflammations, broncho-pneumonia and other existing abscesses or sequestra must first be drained or removed.

Suppuration enclosed in rigid cavities, such as osteomyelitis, are not to be irradiated. Pleural empyema, otitis media and suppuration in accessory cavities promise very little success. Success is assured however in the inflammations of glandular organs such as mastitis, parotitis, orchitis and epididymitis. Patients with a septico-toxic condition improve very rapidly, but the primary focus must first be removed. Treatment should be begun with small doses. Only after disappearance of the previous effect should treatment be repeated. The dosage is 10-20% H. E. D., small doses in spreading highly infectious inflammations, high dosages in those that are walled off.

**The Dose in Cutaneous Radiotherapy, Schulte, Munchener Medizinische Wochenschrift, Vol. LXXIV, No. 29, July 22, 1927.**

The author takes issue with Thedering who has suggested the use of small homeopathic doses. They have not the efficacy in dermatological practice as the usual doses. The x rays, it is true, are very active agents and should be used cautiously. The minimal dose should not be exceeded. It is at times even possible to employ smaller doses than those indicated by Hans Meyer. A cutaneous lesion can be cured with one or two X instead of three or four. The successes attributed to fractions of these doses appear to be due to an adjuvant effect and not to radio-activity per se.

Radiotherapy has two valuable advantages over other therapeutic methods: Cure is rapid and certain with one correct application. Moreover, dressings and medicines are dispensed with. With the usual dose, eczema is definitely cured in four weeks. If the dose is diminished it takes longer to reach a cure. It is important, in dermatological radiotherapy, to use weaker pressures in order to avoid as much as possible the use of filters. It is also of advantage to follow the condition of the capillaries with the microscope.

**A Method of Measuring Infra Red Rays. Presentation of an Inframeter and Emitter of Long Rays. Walter, Bulletin Official de la Societe Francaise d'Electrotherapie et de Radiologie, June, 1927.**

The quantitative measurement of infra red rays is easy. All that is necessary is the use of a thermoelectric pile. These instruments, however, are colored and fragile. The author has constructed a stronger pile of 16 elements.

The qualitative measurements are made by means of a prism transparent to infra red rays. It is necessary, however, to employ the minutest precautions compatible

with therapeutics. The author divides the rays into three zones: Short rays, less than 1.5, penetrating a layer of water 2mm.; medium rays, between 1.5 and 4.5 penetrating a plate of quartz of 2mm. but stopped by a layer of water of 2mm. and finally, long rays, above 4.5 completely stopped by quartz and water. The screens are arranged in an "infra-meter" in such a way as to be in front of a thermoelectric pile. A black body is in a reflector and heated by electrical resistance. The black body has the property of emitting radiations the intensity curve of which, expressed as a fraction of the wave length, passes through a maximum proportional to the temperature of the body. Thus a maximum of irradiations of a given quality can be obtained by varying the temperature.

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**Ultra Violet Glass, Martin Manneheim, Die Medizinische Welt, No. 45, Dec. 10, 1927.**

With the discoveries of the health-giving properties of ultra violet light it was also found that ordinary window glass does not transmit these rays. Recently a window glass has been developed in England which transmits ultra violet rays. A similar glass is now manufactured in Germany and is commercially known as "ultravit" glass. Ultravit glass allows light rays of wave length 310 to 380 to pass. These rays act particularly on the metabolic processes of the body. The purest materials are used in the manufacture of ultravit glass plus a secret component not divulged by the factory.

The great value of window glass permeable to ultra violet light has been proven experimentally in the London Zoological garden. In the Utrecht schools this kind of glass is used. The author advises that the window panes in hospitals, schools, and factories be made of ultravit glass. Bandages can also be made of ultravit glass, thus permitting a continuous influence of the ultra violet rays on the wound.

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**Radium Treatment in Gynecology, Eymen, D. Med. Weir., No. 49, 1927.**

The author gives the indications, technic and dosage of radium treatment in gynecological diseases. As a rule, radium is not used in the irradiation of the liver, spleen, hypophysis and bone marrow because the great amounts of radium necessary for distance irradiation are only available in a few places. Radium is not indicated in adnexal tumors because intra-uterine manipulation is dangerous in this affection. Radium is less efficacious than roentgen rays in the irradiation treatment of amenorrhea, dysmenorrhea and sterility. In the treatment of metropathia hemorrhagica in older women where amenorrhea is desired, as well as in the treatment of smaller myomata (not submucous), radium should receive first consideration. At the present time radium therapy yields at least as much as surgery in the treatment of cervix carcinoma. About 10% of inoperable cervix carcinoma can be cured by radium.

**Diathermic Heat is not the Result of the Joule Effect, H. Bordier, La Presse Medicale, No. 11, February 8, 1928.**

According to Joule's law the heat generated in a conductor traversed by an electric current is proportional to the resistance of the conductor and to the square of the intensity. This law holds true of continuous currents and of currents of low frequency but is not applicable to high frequency currents.

Certain experiments performed by the author have shown that the law is not true of the heat generated by diathermy, be the conductor electrolyte, colloid or living tissue.

Experimenting with progressively decreasing solutions of salt, D'Arsonval found his results to be in complete disagreement with Joule's law. The heat at first increased in proportion as the resistance increased, then it reached a maximum and, following that, it progressively diminished as the resistance continued to be increased. The same divergence was found working with more complex solutions; tap water and human urine. The same results were obtained with colloidal gold solutions, heat diminished in proportion to the increase in resistance.

The explanation given by Professor d'Arsonval is that the medium traversed by the oscillations of high frequency does not only act as a conductor, but rather as a medium having at the same time a resistance of an electrical capacity. Thus there passes from one electrode to the other a current of conduction and a current of condensation. The effects of these two kinds of currents augment each other or neutralize each other, depending on the case. Prof. Fabry has arrived at a mathematical equation in perfect agreement with d'Arsonval's experiments.

The above statements are also true of living tissues, which are really combinations of electrolytes and colloids. The milliamperemeter does not furnish correct results as to the temperature generated in the tissues. The best way is to measure the temperature at the surface covered by the electrode, particularly at the active electrode (of smallest surface). The use of thermo-electric junctions is best adapted for estimating the heat under the electrodes. (Pyrometer with the automatic correction of A. Walter.) The question is still being studied and it is hoped that it will receive a practical solution in the near future.

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**Nature of Action of Ultra Violet Rays on Micro-Organisms. T. H. B. Bedford, Brit. J. of Exp. Path., December, 1927.**

The results of his experiments regarding the nature of the action of ultra violet rays on micro-organisms lead Bedford to suggest that photodynamic sensitizers themselves may act through the agency of hydrogen peroxide or some organic peroxide production, and that the typical sensitizer acts (1) by selective absorption on

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to the organism concerned, and (2) by peroxide formation when visible light falls on the organism-sensitizer combination.

**Diathermy in Gynecology. George Gellhorn, M.D., J. A. M. A., March 31, 1928.**

In the realm of gynecology the application of high degrees of heat by means of diathermy has led to the development of several important and promising methods of treatment of various pathologic conditions. For the present, practical experience has been accumulated in the therapy of chronic pelvic inflammations, gonorrhreal infection of the urethra and cervix, cancer of the uterus, and several minor gynecologic ailments. The pleasing results should not, however, obscure the fact that the new method is only in its infancy, and that a great deal of further careful clinical observation is needed to establish the possibilities and limitations of this new approach. Just because heat of such intensity is a powerful curative agent, it is also capable of causing considerable harm, and it behooves gynecologists to wield it cautiously and judiciously.

**Light Sensitization in Ultra Violet. H. C. A. Lassen, Hospitalstidende, Oct. 13, 1927.**

Lassen found that hematoporphyrin (1:10,000) sensitized paramecia to the innermost and outermost field of the ultra violet rays, i. e., 366-313 millimicrons and 253-240-227-220 millimicrons. At two points in the ultra violet spectrum of the mercury quartz lamp, the relative biologic effect on the paramecia was of maximum intensity; one at 280 millimicrons, the other in the zone between 227 and 220 millimicrons. The fields in which the hematoporphyrin showed a sensitizing effect corresponded to those in which its chief ultra violet absorption occurs.

**The Action of Ultra Violet Irradiation on the Bactericidal Property of the Blood. J. E. Gouce, Jr., M.D., and Karl Kassowitz, M.D., J. A. M. A., January 28, 1928.**

The summary and conclusions of these investigators as appearing in the original article, follow:

1. The biologic action of ultra violet rays on immunity may best be studied independently from other physical factors, by the use of artificial instead of solar radiation.

2. The killing power of blood *in vitro* for certain test bacteria before and after general irradiation affords one criterion for the changes in the antibacterial properties that have taken place in the body.

3. Continuous daily quartz lamp irradiations for more than four weeks with routine exposure time and distance lead, in the majority of all cases examined, to a lowered bactericidal property of the blood.

4. Completely normal persons free from any infection are apt to show improved bactericidal proper-

ties after continuous ultra violet irradiations; those suffering from chronic infections and postinfectious conditions after daily quartz lamp treatments are apt to show a drop in the bactericidal property of the blood.

5. Normal rabbits tested show in all cases a very favorable response to daily ultra violet irradiation.

6. The increased or reduced bactericidal property of the blood after ultra violet irradiation seems to depend largely on the leukocytic reaction of the body. An increased number of white cells, especially of polymorphonuclears, is associated with improved killing power for cocci; a leukopenia is associated with a lowered killing power for cocci.

7. A comparison between the number of leukocytes and the bactericidal property of the blood can be made in the same individual only at different times. Two different individuals may show the same numbers of leukocytes and the opposite antibacterial response. Therefore, we have to assume a comparatively high constancy in the antibacterial function of the single white cell in one individual, but differences in the leukocytic ability of different individuals.

8. In the matter of treatment, the response of the organism should be controlled by the bactericidal test or at least by the leukocytic reaction of the blood. This white blood count should not be made immediately, but instead twenty-four hours after a light treatment and not less than once a week.

9. The borderline between the therapeutic and the toxic dose of ultra violet rays with regard to immunity probably varies in each individual case.

**Angiopathies and Diathermy. A. Zimmern, Progres Medical, October 22, 1927.**

The setting in-action of the peripheral vasodilator reflex by generalized diathermy diminishes the work of the heart. The degree is not the same in all subjects. Generalized diathermy is of value in hypertension of the young, of the overworked, of heavy eaters, of the plethoric as well as in those of the menopause. Migraine, headache, buzzing in the ears, effort dyspnea are all favorably affected by this treatment. Transcardiac diathermy is efficacious in pain of coronary origin. Intermittent claudication and Raynaud's syndrome are both benefited by diathermy. Hepatic diathermy is scarcely known, except as a sedative procedure in biliary tract pain or in pain produced by adhesions. It has been used in cases of stasis in the abdominal viscera. In poliomyelitis it has become a classic. It is indicated in certain edemas and for the treatment of internal hemorrhoids.

**The Penetration of Ultra Violet Rays into Live Animal Tissues. D. J. Macht, M.D., Wm. T. Anderson, Jr., Ph.D., and F. K. Bell, Ph.D., J. A. M. A., January 21, 1928.**

This is an elaboration on a preliminary note on part of the work which was published by Macht, Bell and Elvers in 1925. (*Proc. of Exp. Biol. and Med.*, 23:210-

211, 1925). The present writers argue that it is surprising to find that the literature on the subject of the penetration of ultra violet rays through the skin is extremely meager, and it is still more surprising to find that what little there is on hand contains statements which it is extremely difficult to correlate with the recent observations on the biologic effects of those radiations.

The experiments were performed on living animals, rabbits, cats and dogs, under deep general anesthesia. Data was tabulated by the spectrophotographic method and with the monochromator and thermopile.

The results summarized are:

1. The penetration of ultra violet rays through living animal tissue studied by the methods described above established that penetration of ultra violet rays through the living skin and other tissue is much greater than has hitherto been supposed.

2. Some of the shorter ultra violet rays penetrate through the living skin more deeply than the longer ultra violet rays.

3. A marked difference was noted between the living skin and the dead skin.

4. White human skin is more permeable to ultra violet irradiations than negro skin on account of the presence of pigment in the latter.

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**Radium in the Treatment of Gynecologic and Obstetric Conditions. Charles C. Norris, M.D., J. A. M. A., January 21, 1928.**

The total number of patients suffering from ovarian hypoplasia was 16. In two the dysmenorrhea was cured; in 10 it was lessened, and in 4 there was no change. All these patients suffered from scanty painful menstruation and in many cases the menses was infrequent.

There were five cases of sterility due to ovarian hypofunction, in only one of which pregnancy resulted after treatment. In this patient pregnancy is now four and one-half months advanced and appears normal. She is 28 years of age, has been married eight years and during that time has had three dilation operations, but has never been pregnant. The menses were always scant and painful, and never lasted more than two days. Irradiation was performed a few days after a period. The next period was two days early, lasted four days and was much more profuse than ever before. The patient has not menstruated since, and is now, as has been stated, four and one-half months pregnant. A somewhat similar history of improvement in the amount and character of the flow with diminished dysmenorrhea has been observed in a number of patients similarly treated.

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**A Hospital Physical Therapy Department, John S. Coulter, M. D., J. A. M. A., March 24, 1928.**

Coulter engages in a detailed discussion of the different angles encountered in the conduct of a hospital

physical therapy department. The topics considered are: the hospital staff, class of patients treated in the hospital, the cost of the department, equipment, location of the department, space, records and personnel. Tables are offered showing the income and expenditures of the physical therapy department of a hospital in 1926, and suggested equipment for a physical therapy department and its cost. A diagram showing floor plan of a hospital physical therapy department is also contained in the article.

Coulter concludes that each hospital will have a different problem in establishing a physical therapy department and considerations and suggestions will have to be modified to suit the individual hospital. There is one statement, however, that will apply to every hospital physical therapy department, and that is that the most essential requirement for a physical therapy department is properly trained personnel, for without efficient personnel the department will not be a success.

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**Diathermocoagulation in Dermatology. M. Mienicki, Przeglad Dermatologiczny, Abstract—Fort. der Med., No. 46, 2, January 13, 1928.**

The author gives a very comprehensive description of the apparatus used. He has had successful therapeutic as well as cosmetic results in 110 cases. On the basis of these results, diathermocoagulation is indicated in the following diseases: Lupus vulg. tuberculous cutis verrucosus, lupus erythematosus, lupus pernio, cancer cutis, warts, papillomas, milia, xanthelasma, keloids, klavus, cornu cutaneum, mollusca contagiosa, naevus pigmentosus, angioma, atheromata, telangiectases following roentgen irradiation, acne rosacea and acne vulgaris.

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**Carcinoma of the Breast with Electrical Resection and Radiotherapy, B. H. Orndoff, M. D., Ill. M. J., Jan., 1928.**

The knife, electro-coagulation, desiccation, electro-resection, actual cautery and caustic chemicals are all well recognized agents for tissue destruction which may be used in conjunction with radiotherapy. After reviewing the subject at great length, emphasizing particularly the pioneer work of Emil G. Beck of Chicago, the author describes his methods of pre-operative treatment. The author's own summary and conclusions are here quoted.

1. Heredity is important in the etiology of breast carcinoma and its recurrences but it is our immediate purpose to prolong life in comfort.
2. The value of educational propaganda for the early detection of breast cancer cannot be overestimated.
3. Diagnosis before and after electrical resection is necessary in order to evolve the proper plan for postoperative radiotherapy.
4. Electrical resection for breast tumors, recurrences, or removal of the entire breast and

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axillary glands is the operation of choice for the following reasons:

1. A sterile wound is created.
2. Hemorrhage is decreased.
3. Postoperative pain is less.
4. There is practically no postoperative shock.
5. Danger of metastases is reduced.
6. Recurrence is less frequent.
7. Aids postoperative radiotherapy.
8. Better control of hemorrhage.
9. Tissue not traumatized by hemostats.
10. Circulation not mechanically deranged in the tissue flaps.
11. Danger in the use of needles and sutures carrying innoculating cells into sterile tissue, as well as the creation of anemic zones is avoided entirely.
12. Retaining points on metal clips scarcely enter the subcutaneous tissue, consequently approximate tissues with little damage.
13. Time of operation is reduced.
5. Postoperative radiotherapy over open portals must have light filters in order to avoid visceral damage in the thorax.
6. By the use of methods presented in this paper I have hoped to add only the advantages of electrical resection to the surgical methods advocated by Doctor Emil Beck.

**The Use of Diathermy in the Treatment of Pneumonia, N. J. Seybold, M. D., The Ohio S. M. J., March, 1928.**

After reviewing the usual treatment of pneumonia, Seybold pursues a discussion of the action of heat. Its action on all tissues is to raise local resistance, together with a depressing effect on bacteria. Shortly after the diathermy treatment is begun, the patient is more comfortable; if there is cyanosis it will improve, respiration becomes easier, and the grunt is less audible. Later the temperature curve descends, and the pulse becomes stronger, and still later the patient presents a normal picture, as to temperature, pulse and respiration. Diathermy is not believed by Seybold to be a specific for pneumonia, but rather a distinct aid in its treatment.

Statistics are cited of a series of 66 cases treated at St. Vincent's Hospital, Toledo. Diathermy when properly administered is devoid of danger. It is never an antagonist, but always an ally. The heat besides increasing the local tissue resistance, increases cell metabolism, increases the cell nutrition, and increases blood supply to the part, thereby effecting the absorption of unorganized exudates. The systolic and diastolic blood pressure is reduced slightly after a diathermic treatment in pneumonia. Failure of diathermy early in the disease to bring noticeable symptomatic relief indicates an unfavorable prognosis. The temperature generally drops by lysis.

**The Standardization of the Roentgen Ray Dose, Otto Glasser, Ph. D., and U. V. Portmann, M. D., The Am. J. of R. and Rad. Therapy, January, 1928.**

This is an attempt to re-establish the old electrostatic unit or the roentgen unit as accurately as possible. The investigators have made extensive experiments to correlate this unit with those similarly defined by other investigators in this country and abroad.

This has been done by comparisons of results secured in several research laboratories or by means of calibrated instruments in our own laboratory. Since this is a very difficult and complicated problem the results of these comparisons are not entirely satisfactory as yet but we intend to continue our efforts so that we may accumulate more scientific data and at the same time assist the profession to arrive at a standard dosage.

Practical dosage instruments based upon ionization have been developed and calibrated in R units. These instruments make it possible to measure doses on the patient in absolute and reproducible units.

**The Effect of Carbon Arc Irradiation on the Health of a Group of Infants. Louis H. Barenberg, M.D., and J. Melvin Lewis, M. D., J. A. M. A., February 18, 1928.**

In a paper published a short time ago, the authors reported the results of a study of a group of infants irradiated during the winter months by means of the mercury arc lamp. The object of the investigation was to determine primarily whether ultra violet radiations diminished the occurrence of respiratory infection. It was shown that in spite of systematic exposures to these rays the incidence of these diseases was not altered.

This study brought out the following conclusion: In spite of systematic exposures to the radiations of the carbon arc lamp, no comparative diminution in the incidence of respiratory infections was noted in a series of infants treated for a period of three months.

Growth in weight and in height during the first six weeks was greater in the irradiated than in the non-irradiated group of infants. During the second six weeks however, growth was less among the irradiated infants. These results coincide with those obtained last year with the mercury arc lamp. The number of erythrocytes and leukocytes did not seem to be affected by irradiation. An increased percentage of polymorphonuclear cells was observed among those of the irradiated group during the first and second periods. The hemoglobin percentage of the irradiated group was maintained during the first period, whereas a fall of 12 per cent was noted in the non-irradiated group. Irradiation apparently had no influence on the size of the spleen, liver, tonsils, adenoids or cervical glands. In spite of repeated exposures to the rays of the carbon arc lamp, the pigmentation of the skin was slight in contrast to the marked tanning which resulted from subsequent exposure of only a few days to the sun.